IMPROVED PRODUCTION METHODS

Official Publication of the American Society of Tool Engineers

...nious ...e of the BORING MILL
PAG... 7

Solut...ns to ...duction Problems on SPECIA... GEARS
PA...E 71

...eamlined Production: Better Fixtures for Standard Machines
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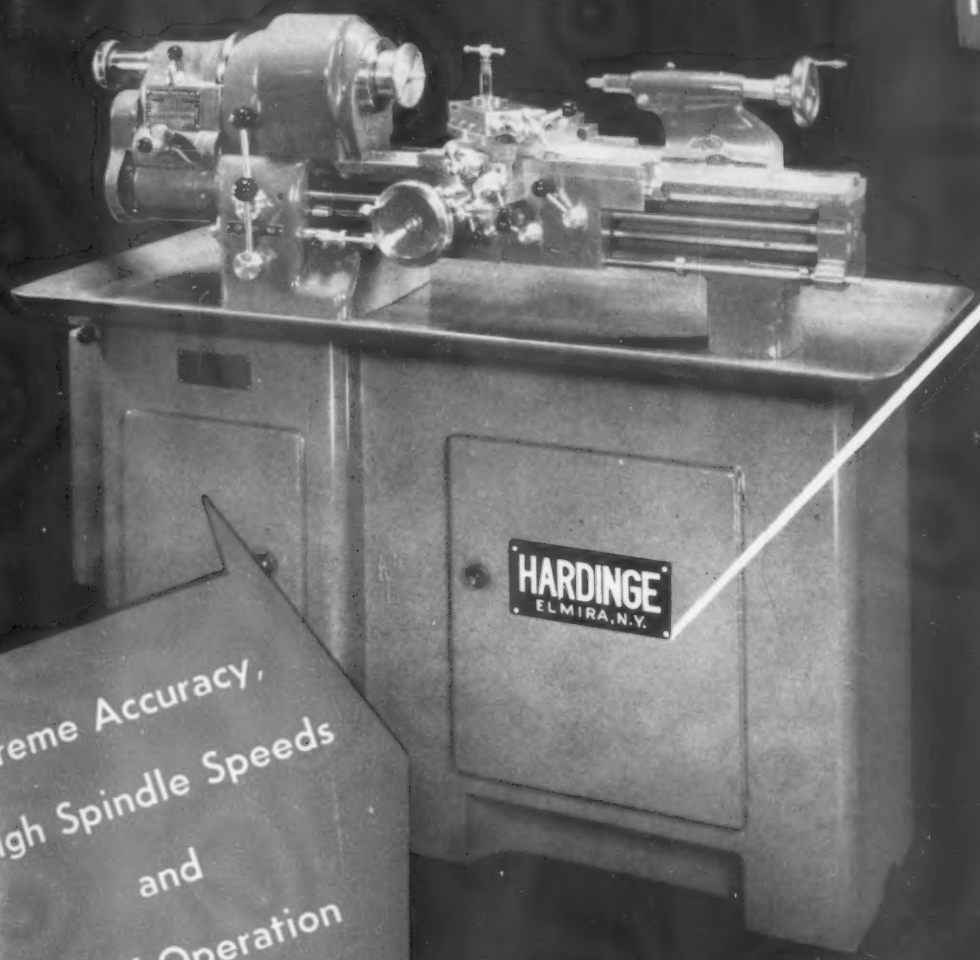
PAGES 85 AND 102

The TOOL ENGINEER

HARDINGE
ELMIRA N.Y.



HARDINGE
HIGH SPEED
PRECISION
TOOL ROOM
LATHE

SPECIFICATIONS
1" collet capacity 9" swing
16" center distance
sixteen spindle speeds
from 27 to 1750 r.p.m.

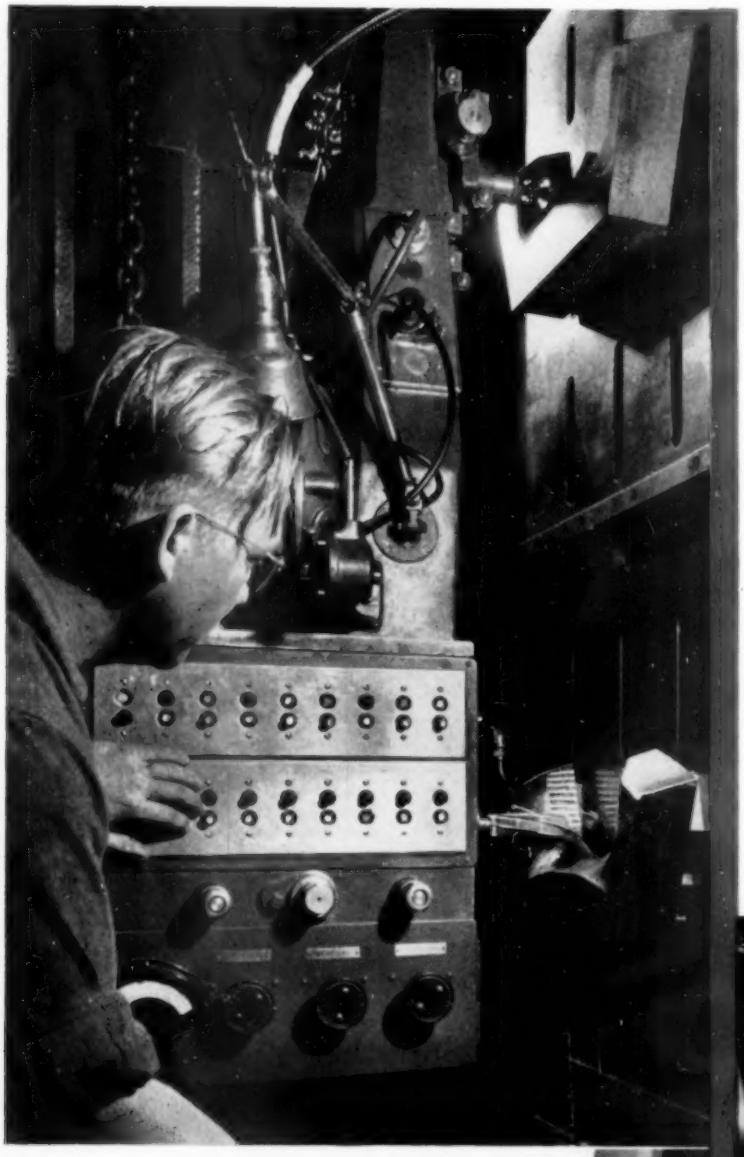
Extreme Accuracy,
High Spindle Speeds
and
Ease of Operation

The combination of extreme accuracy, high spindle speeds and ease of operation means better results under the close tolerances of manufacturing standards both today and in the days to come. The ease and simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

PUBLISHED BY THE BRAMSON PUBLISHING COMPANY

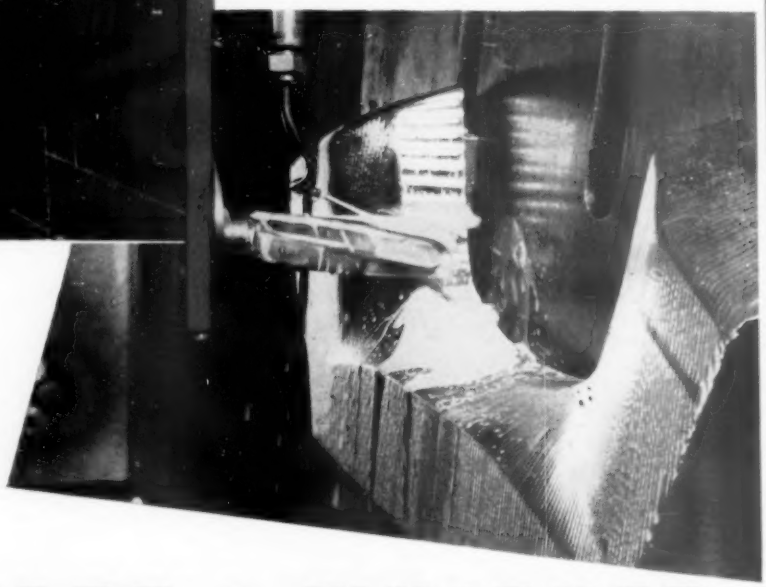
"Pre-Converted"



BUT STILL AT WAR

HERE you see the versatile Keller — the machine with the mechanical-electrical brain that was "pre-converted" for peace the day it went to war. With in-built ability to stand the gaff twenty-four hours a day, this Keller is still on its wartime job, speeding aircraft production in one of America's big plants.

But when its war work is over there will still be no rest for the Keller — no time out to be rebuilt or adapted for peace. It was pre-converted to start with, and its "brain" will function with the same speed and dexterity in shaping dies or parts for the postwar products of tomorrow. It will continue to serve the designers, engineers and production men who (soon we hope) will be setting their sights higher than ever in the coming fight to win the peace . . . to produce more and better . . . at the lowest possible cost.



Right — Speeding aircraft production, this Keller is automatically shaping a vital part, as its mechanical-electrical brain follows the template shown at the top of the larger picture. Operator sets up the job with push buttons — the Keller does the rest.

PRATT & WHITNEY

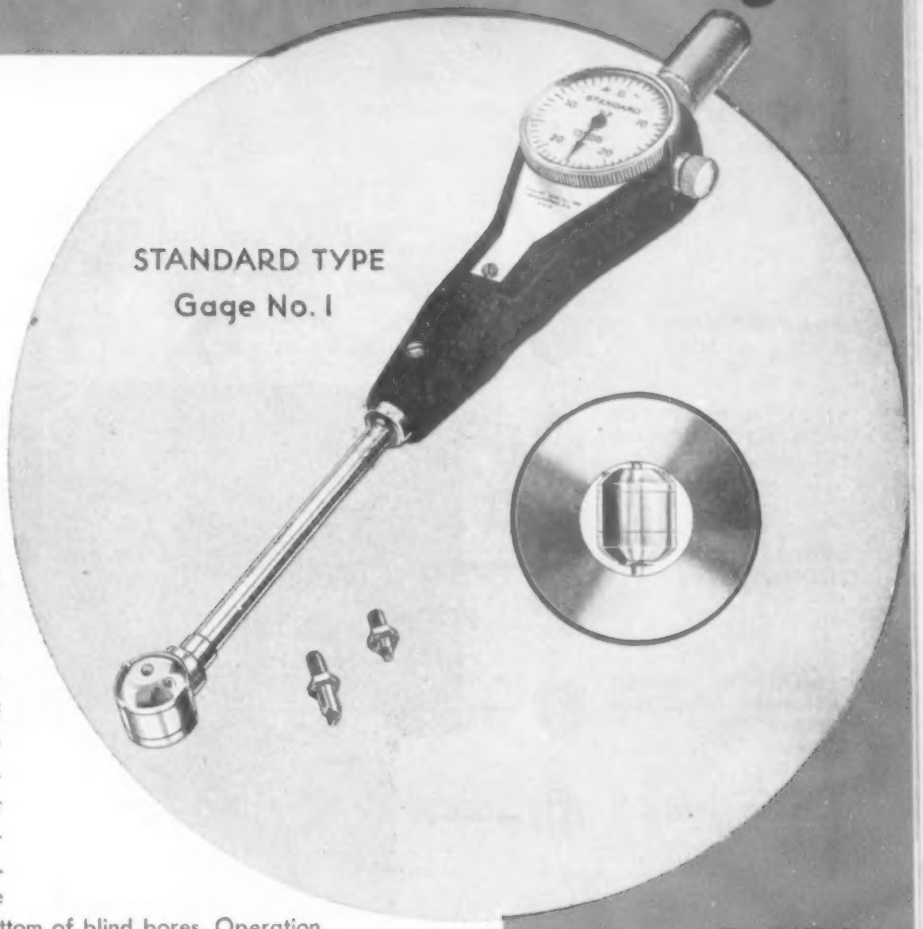
Division Niles-Bement-Pond Company

WEST HARTFORD, CONNECTICUT, U. S. A.

A NEW STANDARD Dial Bore Gage

for measurements ranging from 5/8" to 1" with UX Indicator graduated in .0001"

Fast, Light, Accurate...



HERE'S the newest addition to the STANDARD family of Dial Bore Gages. A small, lightweight, fast, close-tolerance checking instrument for small bores comparable in accuracy with the larger size dial bore gages.

Utilizing the same centralizing principle of other STANDARD Dial Bore Gages, it is only necessary to insert the gage, and rock handle slightly. Minimum reading on indicator shows exact diameter. Even holes with obstructions such as shoulders, webs, undercuts, etc., can be measured because this Dial Bore Gage can measure within ¼" from the bottom of blind bores. Operation is reduced to a minimum; accuracy and precision assured; and the range of workability is considerably increased as a result of improved design.

Other Dial Bore Gages with measuring range to 12⅛" completely illustrated and detailed in our new No. 10 Catalog. Send for it.

New, improved STANDARD Dial Bore Gage with diameter extensions furnished with each gage. Cross section shows gage in use.

STANDARD Dial Snap Gage

Combines Snap Gage Speed with Comparator Precision

STANDARD Dial Snap Gages combine PORTABILITY with speed in use and absolute accuracy on dimensions as fine as .0001". Adjustable gaging pin has a serrated flat surface tipped with tungsten carbide that practically defies wear. Opposite movable pin has mushroom top, also tungsten carbide. Point-and-plane construction assures continued, accurate readings whether instrument is set by cylindrical or flat standards.

16 Stock Sizes cover Range 0" to 8". Each can be set to measure any dimension within a range of ½". Sizes measuring up to 4" designed as at right. Sizes 4" to 8", because of larger size, are made with convenient finger hole grip for greater ease in handling.

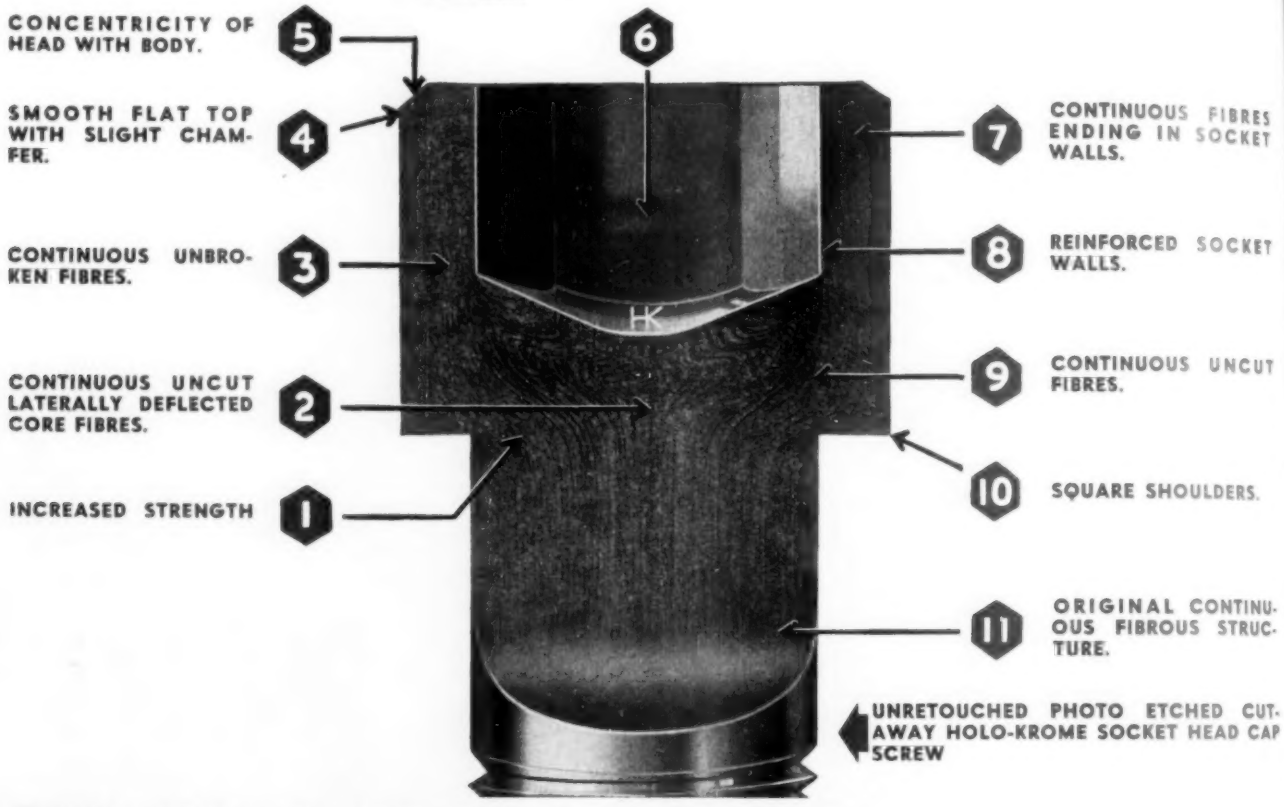
Write for Special Bulletin on STANDARD Dial Snap Gages.

ARMY (E) NAVY

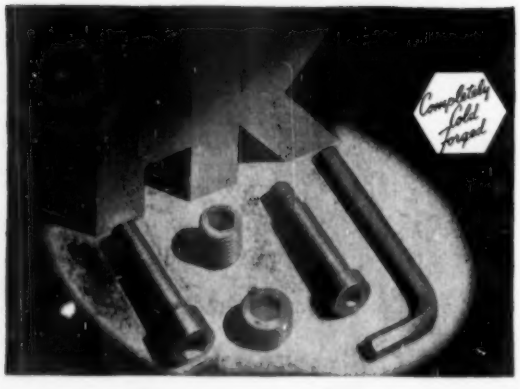
STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

Completely Cold Forged

SOCKETS—UNIFORMLY ACCURATE TO FULL DEPTH OF HOLE—TRUE HEXAGONAL SHAPE —ACROSS FLAT SECTION DIAMETER IDENTICAL TOP AND BOTTOM — NO TAPER — SMOOTH REGULAR WALLS—WELL DEFINED CORNERS.


5 CONCENTRICITY OF HEAD WITH BODY.
4 SMOOTH FLAT TOP WITH SLIGHT CHAMFER.
3 CONTINUOUS UNBROKEN FIBRES.
2 CONTINUOUS UNCUT LATERALLY DEFLECTED CORE FIBRES.
1 INCREASED STRENGTH
6
7 CONTINUOUS FIBRES ENDING IN SOCKET WALLS.
8 REINFORCED SOCKET WALLS.
9 CONTINUOUS UNCUT FIBRES.
10 SQUARE SHOULDERS.
11 ORIGINAL CONTINUOUS FIBROUS STRUCTURE.
UNRETOUCHED PHOTO ETCHED CUTAWAY HOLO-KROME SOCKET HEAD CAP SCREW

THE HOLO-KROME METHOD PRODUCES THE RESULT



In Socket Screws where strength in the shoulder and in the Socket is essential, continuous fibres are of vital importance. . . . In Holo-Krome FIBRO FORGED Screws the fibres originate in the shank and continue uninterrupted, unbroken and uncut around the socket bottom between it and the shoulder of the screw and terminate in the socket walls. The finished product has all the advantages of the original material plus the additional strength imparted by the Holo-Krome Completely Cold Forging process . . . The Holo-Krome Method produces the result.

GUARANTEED UNFAILING PERFORMANCE

THE **HOLO-KROME** SCREW CORP. — SOCKET SCREW PRODUCTS — HARTFORD 10, CONN. U. S. A.

VOLUME XIII APRIL, 1944 NUMBER 4

THE TOOL ENGINEER

T.M. REG. BY AMERICAN SOCIETY TOOL ENGINEERS

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Publisher's Letter

AS this page goes to press and Associate Editor Ralph Davis is calling for this "copy", we have just received a most interesting letter from a former staff member, now a lieutenant in the United States Army Air Forces.

•

Bill Kresin's enthusiasm is typical of our youths in their twenties who have gone forth to fight this war.

Says Bill: "I've just had my first flight in a B 24—one made at Willow Run. It's a big ship and it's sometimes surprising to think that such a huge hulk can fly. We flew over the L. A. area and, of course, were able to get an excellent view of the city. That was my first time above a community of any size and I was really amazed.... tried imagining it was Berlin and the havoc that could be wrought if there were many of us in these mammoth planes toting full loads of blockbusters."

Bill is a fine young man. When he was here on our editorial staff he was conscientious, a good and careful writer and a born mechanic—guess that's why the army has honored him and trusted him. A big bomber represents, probably, a half million dollar investment. These young men have great responsibility when they take these big ships aloft. But they come through. Yet, Bill is thinking of the future of his country and his work.

•

He goes on to say: "Here's something you should give thought to. Heavy industry has been introduced to the West Coast for the first time, and if the determination of the Coast people means anything it's here to stay. They have their own steel mills, tool shops.... can obtain their own coal, ores, from nearby Utah, Arizona, California, Washington, Oregon. Electric power is cheap, too.

"Maybe the West will not compete with the East on a national basis but I'm willing to bet that as a sectional unit, the coast can take care of itself for the most part. At any rate there is heavy industry on the Coast, and its post-war problems should be of definite interest to our readers.... it's a subject that demands attention and presentation...."

•

Right, Bill and we'll get going in a hurry. Though we've presented one or more technical articles from West Coast industry almost every month, there is a big story yet untold in the post-war prospects of Western mass manufacturing.

West Coast readers who have suggestions or ideas for such "copy" please write me. I'm sure this is a subject of interest to you and to all our readers.

Regards,

Cordially,

Roy T. Bramson

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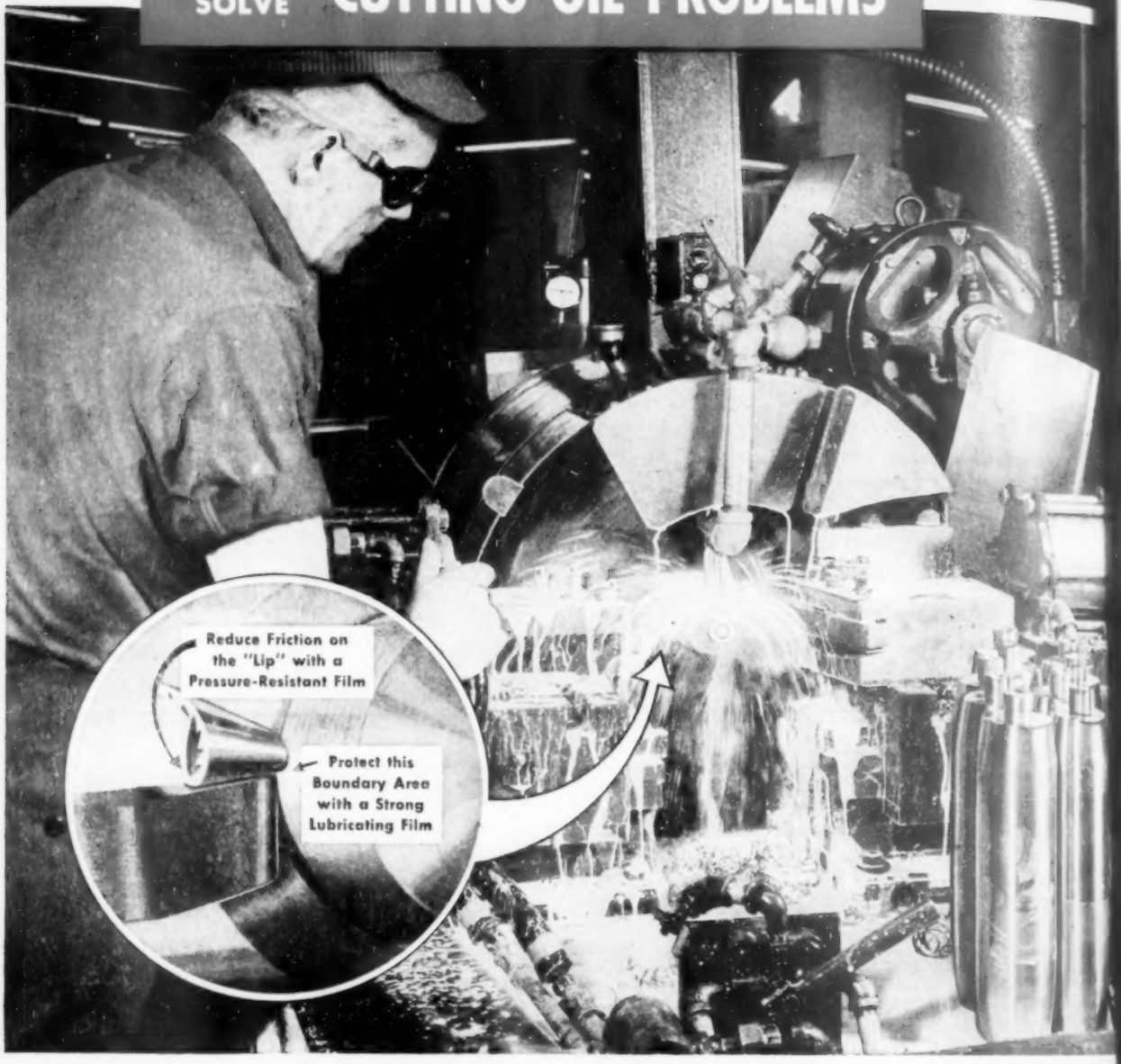
HOW TO SOLVE

CUTTING OIL PROBLEMS



50% Added to Cutting Tool Life!

IN SOME CUTTING OPERATIONS, like this shell facing and grooving, the pressures on the lip of the tool may run into hundreds of thousands of pounds per square inch. Temperatures in the boundary area may reach 1,000°F., or even higher.

Under such conditions, cutting tools are likely to wear out rapidly, causing frequent replacements, reducing production.

The answer is correct cutting fluids with high pressure resistance and lubricity characteristics, such as the S/V Sultran Cutting Oils and S/V Solvac Oils.

These oils were recommended recently to shell manufacturers who were having trouble with excessive tool wear. Results in one typical instance: Tool life increased from 8 to 12 hours. Production increased from 140 to 180 pieces.

You may expect similar results with Socony-Vacuum cutting fluids.

GARGOYLE Lubricants

SOCONY-VACUUM

OIL COMPANY, INCORPORATED

SOCONY-VACUUM OIL COMPANY—Standard Oil of N.Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Magnolia Petroleum Co. • General Petroleum Corporation of California

Kearney & Trecker *Presents...*

the new 50 H. P. *C. S. M. *Milwaukee*

EXPRESSLY DESIGNED FOR

Negative Angle MILLING!

If you've been looking for a milling machine that's big and rugged, with plenty of POWER — a machine that can take it — the 50 H.P. — C.S.M. was made-to-order for you.

This machine was designed and specially engineered to do *Carbide Steel Milling, but because it's an all-purpose machine, it will handle your regular milling jobs to perfection.

TOPS FOR *Negative Angle* MILLING

For the past year this machine has been handling all of the "Negative Angle" milling jobs in our own plants. If you have a Negative Angle milling problem, we believe this is the machine you need.

NOTE: Our Research Department will gladly help you with problems concerning Negative Angle milling. We invite your inquiries. Write Department C.S.M., Kearney & Trecker Corporation, Milwaukee 14, Wisconsin.

KEARNEY & TRECKER CORPORATION

C.S.M. FEATURES

- ★ 50 H.P. motor
- ★ Impact eliminating flywheel
- ★ Spindle speeds from 50 to 1250
- ★ Feeds — ¼" to 60"
- ★ Electric spindle brake
- ★ Available in both Horizontal and Vertical models

Milwaukee Machine Tools

Faster Delivery

ON ALL TYPES OF INTERNAL AND EXTERNAL BROACHES

from

DETROIT BROACH COMPANY

With our expanded plant facilities, we have been reducing our backlog at a swift pace. As a result, all broaches . . . even the most complicated formed inserts and long spline broaches . . . are available on much shorter delivery.

Now is the time, when equipment is quickly available, to think of what broaching can do to increase the efficiency of your plant and lower machining costs. Remember that broaching can provide greater speed, better accuracy and finer finishes. With broaching it is often possible to perform several operations at once. Superior finish and accuracy may make it possible to eliminate subsequent operations. Competent Detroit Broach Company engineers will gladly go over your operations with you and show you just where broaching can help you.

ARMY NAVY

DETROIT BROACH COMPANY

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STELLITE High-Production Cutting Tools *for Low Cost per Piece Machined*

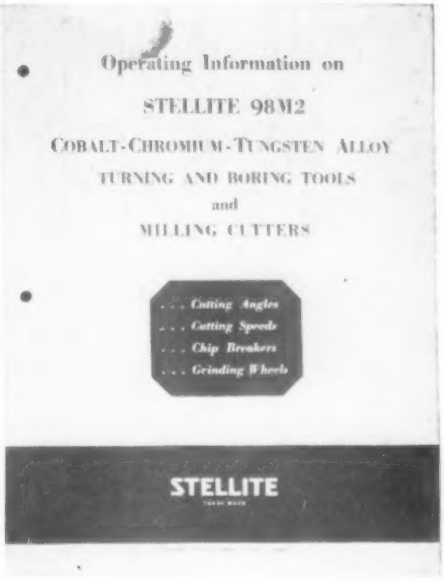
STELLITE 98M2 metal-cutting tools are made especially for faster machining of steel. These cobalt-chromium-tungsten alloy tools are also excellent for brass, bronze, cast iron, and most of the machinable materials. They are generally used for turning, facing, boring, grooving, and forming all these materials, and for milling mild steel, cast iron, brass, and bronze.

STELLITE 98M2 alloy has high red hardness, good edge strength, and unusual toughness. This combination of properties makes possible heavy cuts at high speeds with coarse feeds, which in turn means high production at low cost per piece machined.

Write for copies of the informative booklets about STELLITE 98M2 tools illustrated below.

The booklet (left) describes the type of STELLITE 98M2 tools that are available, including sizes and prices for each type.

Through drawings, photographs, and charts, the eight-page booklet (right) describes the cutting angles, lists recommended speeds and feeds, shows chip-breaker grinds, and gives information on wheels for grinding STELLITE 98M2 tools.



Standard Tools in Stock

SOLID TOOL BITS — Square, flat, or round . . . wide range of sizes . . . finish-ground ready for use in standard tool holders. Easily converted to various profiles.

WELDED-TIP TOOLS — A variety of styles and sizes for use where solid bits are impracticable.

MILLING CUTTER BLADES — For many cutter body types, including Ingersoll, Kearney & Trecker, Modern, Production, OK, and Continental.

Special Tools to Users' Specifications

Many types of special STELLITE tools are regularly supplied, cast and finish-ground to users' specifications. These include solid bits, welded-tip tools, milling cutter blades, reamer blades, brazed-in blade shell end mills, form tools, boring tools, counterbores, spotfacers, and reamers.

Complete information on special STELLITE tools can be obtained from any Haynes Stellite Company district sales office.

STELLITE
Reg. U. S. Pat. Off.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

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BUY UNITED STATES WAR BONDS AND STAMPS

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

The word STELLITE is a registered trade-mark.

Hot arcs stopped *Cold!*

A circuit breaker must work fast . . . pass harmless overloads without interruption . . . yet when danger threatens, it must open the circuit and quench the arc—quick!

Westinghouse "De-ion" Circuit Breakers do this—and protect themselves, too—burns and pits are minimized, contacts last longer.

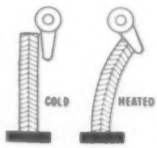
To restore service instantly, once the disturbance is cleared, simply flip the indicating handle. No waiting—no repairs—no parts to replace.

Protect equipment and circuits with Westinghouse "De-ion" Circuit Breakers. Ratings up to 600 amperes; enclosures for nearly every type of service. Call your Westinghouse Representative today. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-21297

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

"DE-ION" CIRCUIT BREAKERS

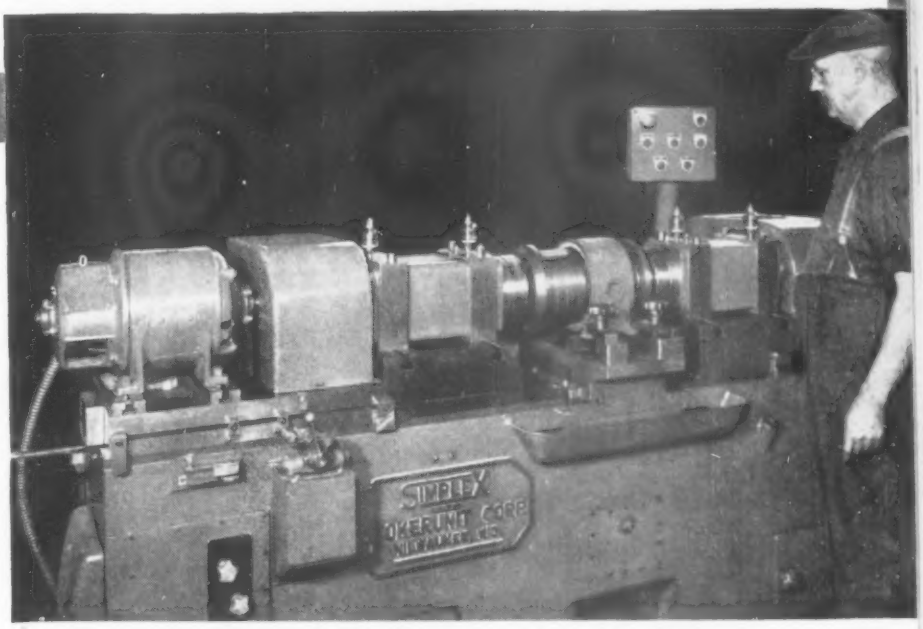


DEFENDING THE CIRCUIT is the job of this Westinghouse Bi-metal element. Two metals which react differently to heat are bonded together. Threatening overloads cause the Bi-metal to bend, tripping the interrupting mechanism and opening the circuit—*before* any damage is done.

STOPPING ARCS COLD is the task of the "De-ion" arc quencher . . . consisting of parallel metal plates in the form of a grid. It draws the arc into the quenching chamber, divides it into segments . . . smothers it between the plates . . . in the space of a half cycle.

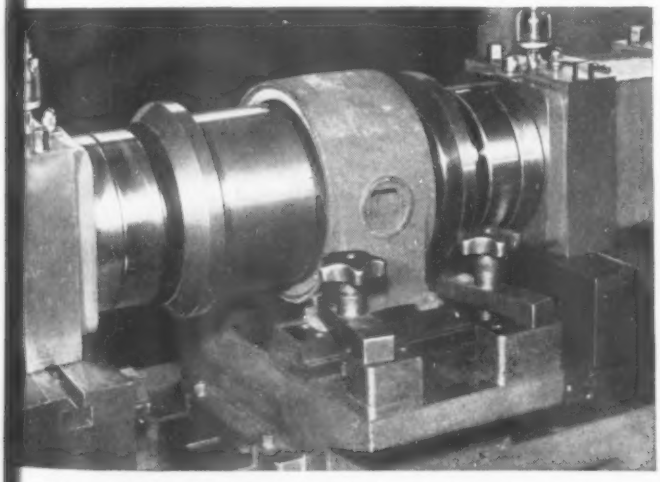
accuracy speed and finish } Combined by a STOKERUNIT SIMPLEX Precision BORING MACHINE

The finished motor stator yoke as it came from the Simplex Precision Boring Machine



Conveniently located push-button controls govern the entire machining cycle of this Simplex 2-U Two-Way Precision Boring Machine

Precision Boring and Facing on Motor Stator Yoke Completed In One Operation With 2-U Two-Way Model



Fixture is built with interchangeable locators for various sizes

Boring, facing and counterboring operations on this motor stator yoke were combined by the manufacturer into one operation with a Stokerunit Simplex 2-U Two-Way Precision Boring Machine.

Four tungsten carbide cutting tools, three on the long end, one on the short end, operate simultaneously to complete the three required boring operations at different diameters and depths in a minimum of boring time. Ease and speed in set-up of the part also brought savings in floor-to-floor operations.

In addition to savings in time, the manufacturer obtained high finish and close tolerances on all required bores. All diameters were held well within tolerances of +.002″ and −.000″. This model is capable of maintaining accuracy to .0002″ with excellent finish and is also used for the boring of both larger and smaller stator yokes. Only minor adjustment of the machine and a change in the size of cutting tools used are necessary to adapt the Simplex 2-U Two-Way Model for use in the precision boring of these parts.

Write Today for these two Simplex Booklets which contain complete data and specifications on the entire line of Stokerunit Simplex Precision Boring Machines. For specific recommendations send blueprints of parts together with your production requirements. You are under no obligation.

Stokerunit Solves Your Boring Problems

Twenty-five versatile models of Stokerunit Simplex Precision Boring Machines are available, covering almost the entire range of precision boring applications. They are furnished with either hydraulic or mechanical feeds, with single or multiple spindles and are adaptable to either short-run or production work. Simplex precision boring machines enable you to obtain accuracy and finish in boring, even with inexperienced operators.

STOKERUNIT CORPORATION

SIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINE

4528 WEST MITCHELL STREET • MILWAUKEE 14 WISCONSIN

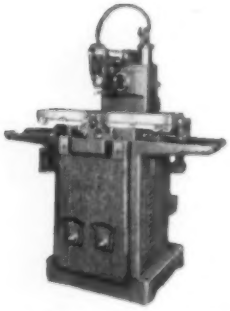
Call on

KENT-OWENS

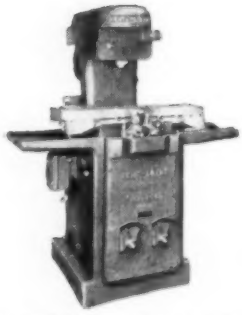
for Milling Machines

Rugged...
Simple...
Efficient...

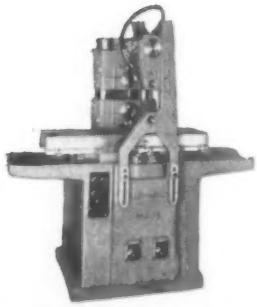
No. 2-20... 20" table travel... 42" x 12" table... full automatic hydraulic table feed.



No. 1-14... 32" x 9" table.. 14" table travel... hydraulic table feed... full automatic cycle.

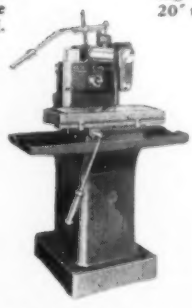


No. 1-14V... 14" table travel with full automatic cycle... spindle speed range 115 to 3000 R. P. M.



No. 2-20DS... Double Spindle Machine for performing two milling operations at same time... 20" table travel... 42" x 12" table.

No. 1-V... Hydraulic vertical head feed... 5½" head travel... 25" x 9" table.



No. 1-M... Hand feed to table and head... 25" x 9" table... 1 H. P.... head counterbalance is adjustable.

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

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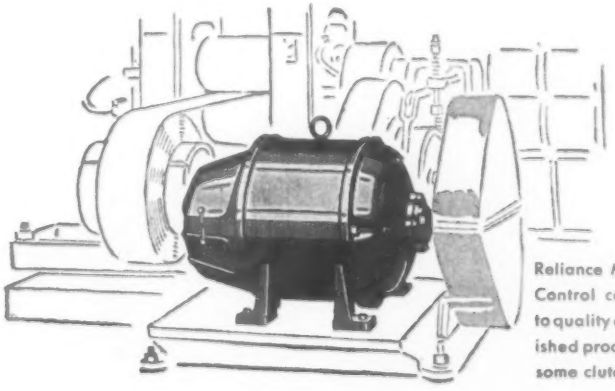
KENT-OWENS MACHINE CO., TOLEDO, OHIO

TENSION!

Tension Control can be an important production factor in the processing of such materials as metals, paper and cloth, which are wound on drums or cores. Tight, evenly-wound rolls and uniformity of the finished product often depend upon it.

All of the characteristics necessary to maintaining proper and constant tension control are inherent in Reliance Electric Motor-Drive.

The pioneering work done by Reliance engineers in putting motor-drive to profitable use along these lines proves again that motor-drive *can* be *more than power*. The results of their experience are available to you at any time.



Reliance Motor-Drive for Tension Control contributes substantially to quality and uniformity of the finished product, eliminates troublesome clutches—and lowers costs.

RELIANCE A-C D-C MOTORS

RELIANCE ELECTRIC & ENGINEERING CO.

1088 Ivanhoe Road • Cleveland, Ohio

Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S.C.) • Houston • Los Angeles • Minneapolis
New York • Philadelphia • Pittsburgh • Portland (Ore.) • St. Louis • San Francisco • Syracuse • other principal cities.

Converting SIDNEY LATHE PRECISION TO AIRCRAFT ACCURACY

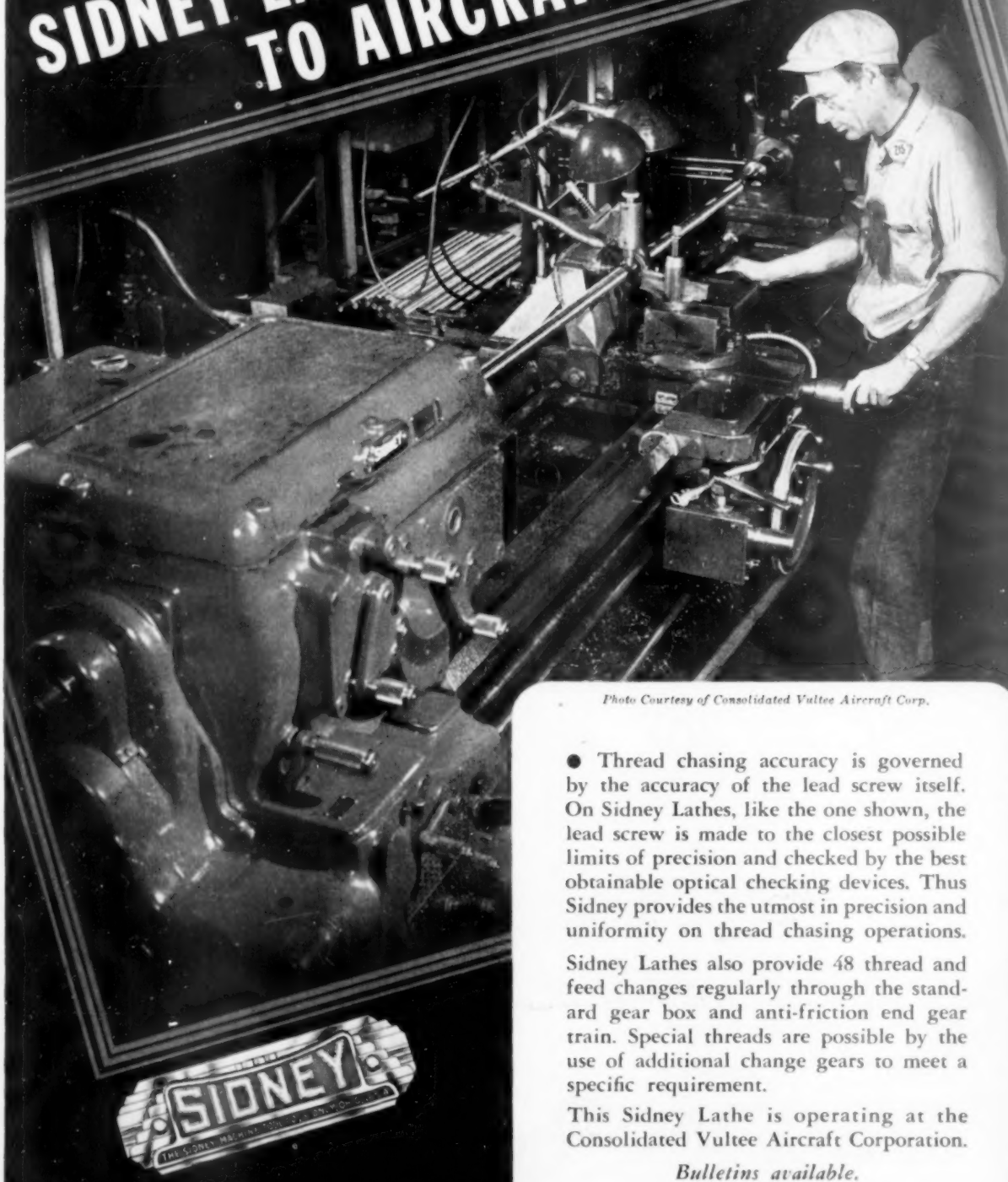


Photo Courtesy of Consolidated Vultee Aircraft Corp.

● Thread chasing accuracy is governed by the accuracy of the lead screw itself. On Sidney Lathes, like the one shown, the lead screw is made to the closest possible limits of precision and checked by the best obtainable optical checking devices. Thus Sidney provides the utmost in precision and uniformity on thread chasing operations.

Sidney Lathes also provide 48 thread and feed changes regularly through the standard gear box and anti-friction end gear train. Special threads are possible by the use of additional change gears to meet a specific requirement.

This Sidney Lathe is operating at the Consolidated Vultee Aircraft Corporation.

Bulletins available.

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY — ESTABLISHED 1904 — OHIO

There are many GOOD THINGS AHEAD . . .

Transparent plastic cells will make easier the checking of storage battery solutions.

A new coating for metal is claimed to have five times as much resistance to salt spray as galvanizing.

A chemical substance, added to hard nickel alloys, is claimed to save 75% of machining time.

With the promise of an infinity of electronic tube applications, the effect of their radiation on humans is being carefully studied. There seems to be no evidence of ill effects from even long exposure.

The new thyratron motor control, which makes possible the operation of D. C. motors from A. C. current supply, is said to permit exact variations in speed from 25 to 1,750 r.p.m. by the turning of a graduated knob.

Many new kinds of ink have been developed for war needs, including one that is oil-proof which is used to print instructions on mechanical parts. Another prints the lines on gun sights and surveyors' instruments for which spiders' webs were formerly used.

A new series of plastics containing silicon has very great resistance to heat.

The old "lost wax" process of casting, long a method of jewelry manufacture, has been revived for the making of small, complex mechanical parts.

A small section of Connecticut highway is being paved experimentally with steel mat similar to that used for quick construction of landing fields and on invasion beaches.

A new high-speed X-ray inspection machine is claimed to be capable of photographing as many as 17,000 castings per hour on a continuous film.

A new landing gear, for aircraft, works on the caterpillar principle, and is said to be lighter than the conventional wheels with from four to eight times the supporting surface.

A new cement that may be applied with a brush and set with a flat iron is claimed to bond metals with a strength and permanence equal to spot welding.

In one of the trickiest of new finishing processes, the sprayed paint coats one side of an object and, after passing by it, turns around and returns to paint the other side.

Broken drills and reamers are being removed from holes with dynamite.

A new 120-inch searchlight, with 900-watt mercury light source, develops 7,500,000 candle power.

So many uses are anticipated for glass fibers that they are being produced in seven standard types. Their fibers are now being used in making filters and insulation, for reinforcements in felt, paper, plastics and alone, or in combination, with cotton, rayon or asbestos in textiles.

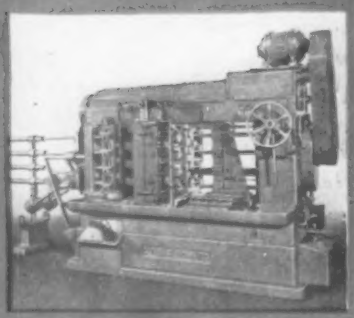
A new method of checking liquids during processing depends on the observation of color by a photo-electric colorimeter.

Aircraft piston rings finished with oil-retaining, porous chrome plate are reported to increase by five the flying time between overhauls.

A new "wide-angle photo-electric scanner" is offered as an inspection or safety device. While the work that it does is similar to that done by more familiar applications of the "electric eye", the new device scans the whole of an area, such as a sheet of paper or the space in front of a machine. Any change occurring in the area produces a reaction that may be used to give a warning signal or shut off power.

When you think ahead, think of production like this

These four tension bolts are all made at once, automatically, in twelve seconds — three seconds each — on the one-inch 4-spindle Vertical Conomatic. Production like this has helped America to overcome the time advantage of its enemies in war, and will help American manufacturers to overcome competition in time of peace.

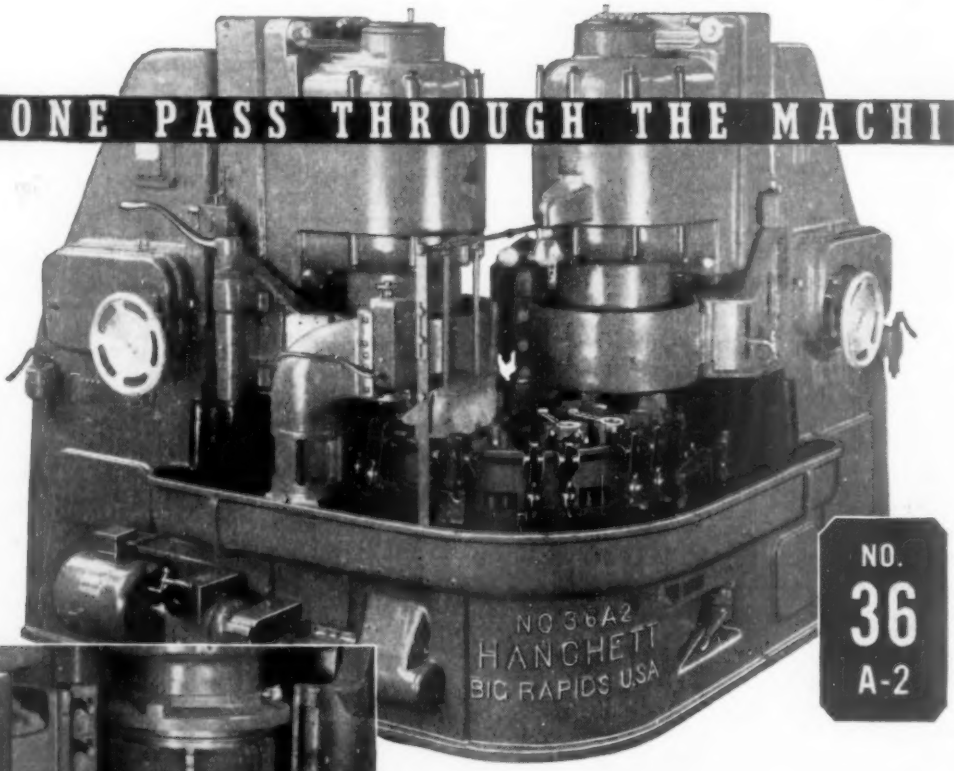


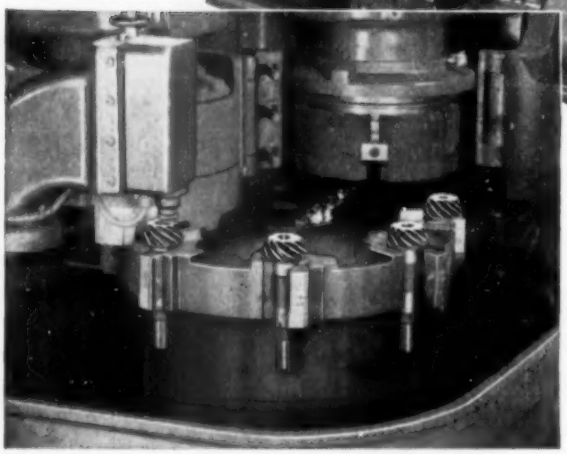
CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

Rough Cut AND fine finish

IN ONE PASS THROUGH THE MACHINE





By combining rough cut and finish in one operation, the Hanchett 36-A2 Surface Grinder abolishes needless duplication of set-ups and handling—reduces actual operation time—vastly increases production per man hour.

For example, one revolution of the magnetic chuck passes the work under (1) a segmental wheel for the rough cut; (2) a cylindrical wheel for fine, precision finishing; (3) the Automatic Sizer which compensates for wheel wear.

Many helpful features have been incorporated in the 36-A2 to increase operator efficiency through eliminating work rejects and adding to quality production. Send for catalog and details.

FEATURES FOR PEAK PRODUCTION

(1) 2 Grinding Heads—means one set-up suffices for two different jobs on one machine.

(2) 43 inch Magnetic Chuck—provides large magnetic area for handling a wide range of parts.

(3) Automatic Sizer—compensates for wheel wear—assures constant uniformity, saves inspection time.

(4) Built-in wheel dressers for fast, cool cutting action of grinding wheels.

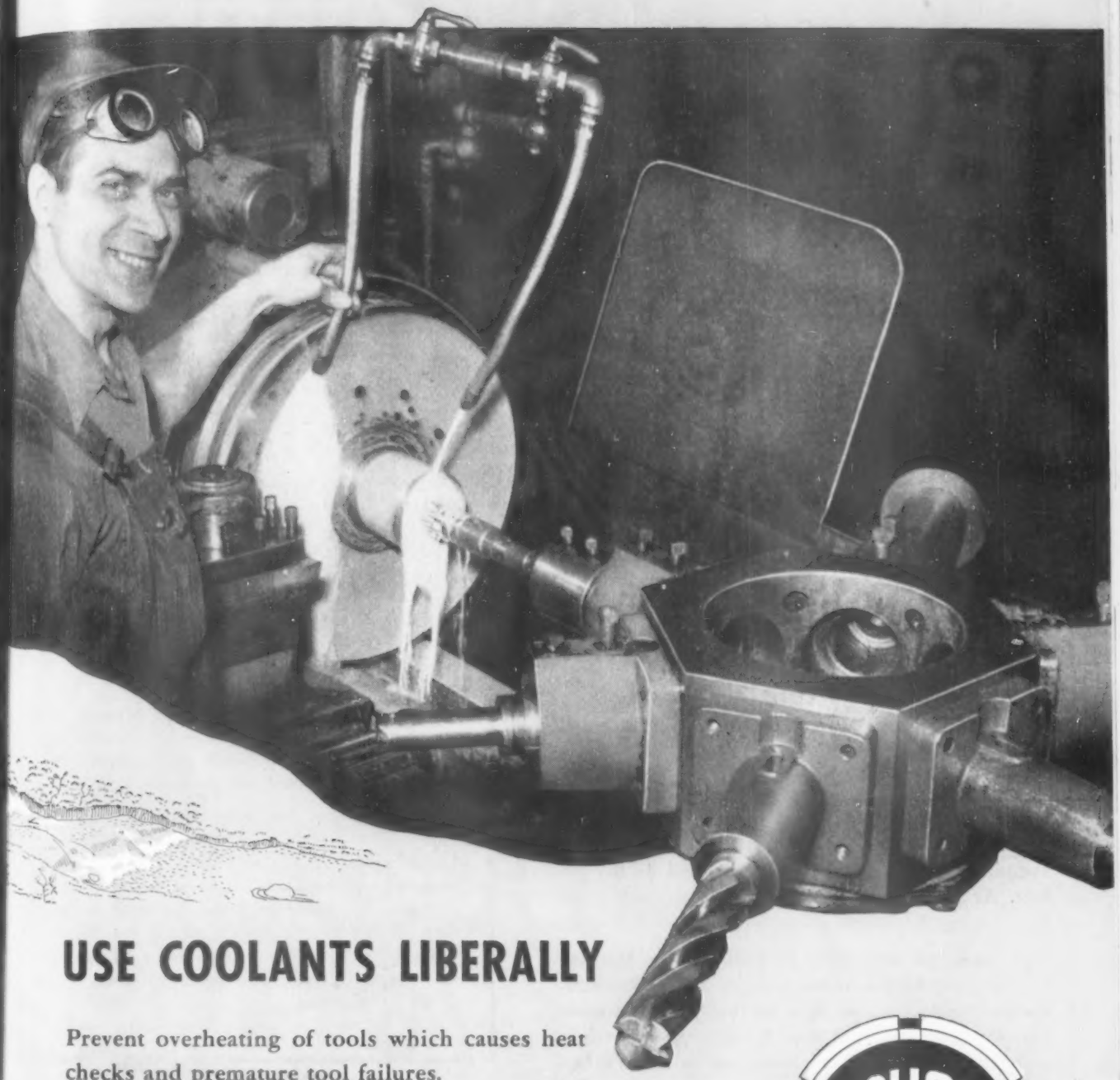
(5) Centralized, electric push-button controls, conveniently located.

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

KEEP COOL!



USE COOLANTS LIBERALLY

Prevent overheating of tools which causes heat checks and premature tool failures.

Don't let work get hot and difficult to handle.

Heat distortion makes accuracy difficult to maintain.

Mere trickles aren't enough. When using any coolant, flood the tool and the work for best results.

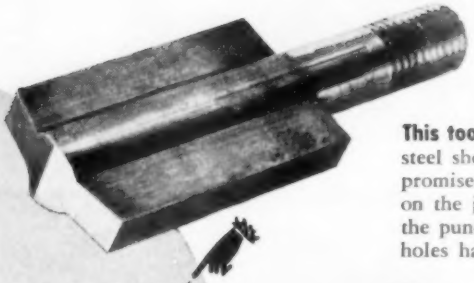
GISHOLT

Reproductions of this page on enameled paper are available for bulletin board use in your turret lathe department. Write the Gisholt Machine Company, 1229 East Washington Avenue, Madison 3, Wisconsin. Ask for the series of "Wartime Care and Operation Posters." State quantity desired.

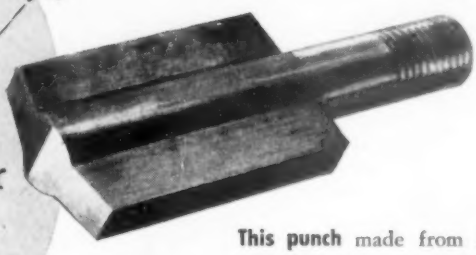
Which

OF THESE TWO TOOLS

Will Stay On The Job Longer and Increase Machine Output Per Month?



This tool for punching 3/16" thick O. H. steel sheet was made from a tool steel that promised to provide the *toughness* needed on the job. But excessive wear meant that the punch had to be reground after 190,000 holes had been punched.



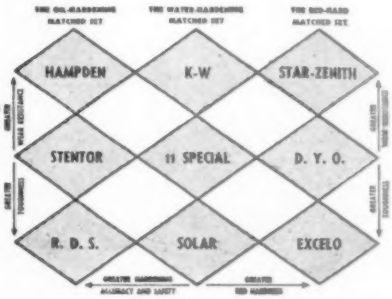
This punch made from *Stentor* tool steel provided just the right combination of toughness and wear resistance for the job. With it, production jumped over 100%—to 387,000 holes between grinds!

here is WHY one tool does a better job...

A tool giving 100% more production isn't just a stroke of luck! The tool room foreman knew what he needed for the job. He had found a *definite system* for picking the one tool steel that would do the job best. And as the heat treater had complete, easy-to-use instructions, they got real results from the very first.

You can do the same thing, by following the Matched Set Diagram. Carpenter can give you a definite system for finding the best tool steel for each job. And when you put Carpenter's heat treating information to work, you get real results. Full information on the Matched Set Diagram together with an 80-page tool index and steel selector is given in the Carpenter Matched Tool Steel Manual. Free to tool steel users in the U. S. A. Write for your copy today on your company letterhead.

The Carpenter Steel Co., 122 W. Bern St., Reading, Pa.



The Carpenter Matched Set Method. It points the way to the tool steel properties you need for almost any job. Result — better tools, more output from machines and presses, lower production costs.

For example, you start with the diamond in the center of the diagram, *No. 11 Special* straight carbon (water-hardening) tool steel. But when you want greater *wear resistance*, you travel *north* on the diagram. For greater *toughness*, you go *south*, etc. Each of the *Matched Tool Steels* on the diagram picks up its job where another leaves off, so you know in advance just what results to expect.

Carpenter MATCHED TOOL STEELS

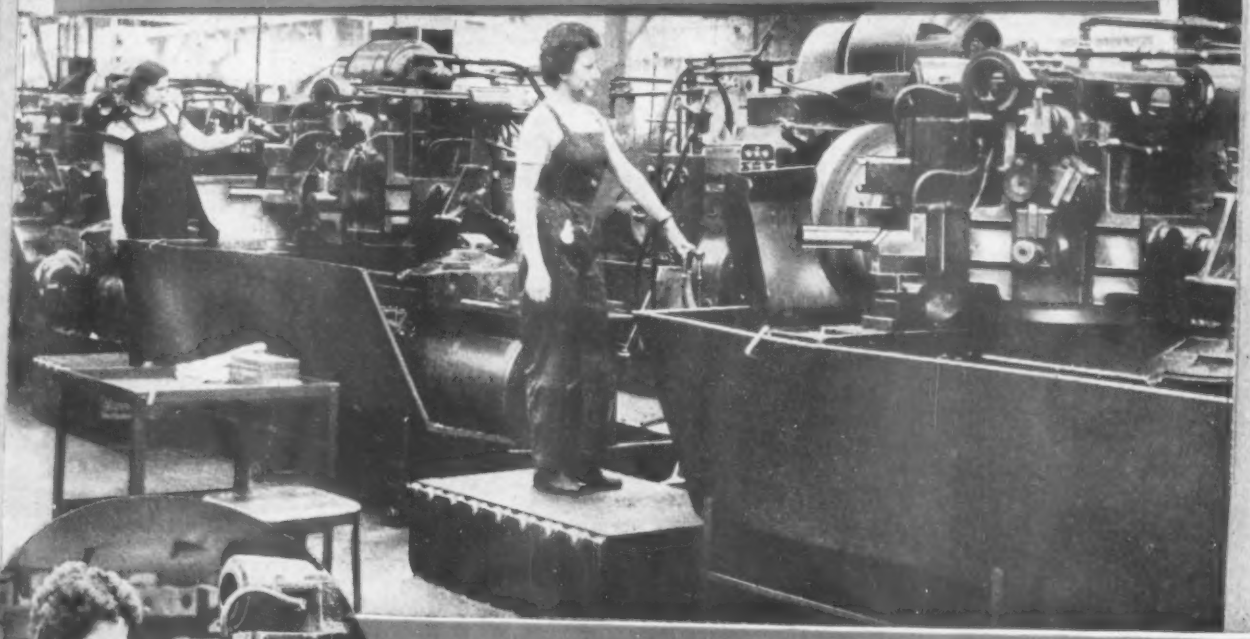
"The Hand that Rocks the Cradle"

KEEPS PRODUCTION ROLLING EASILY...ON

P & J AUTOMATICS

Convenience and easy operation of P & J Automatic Chucking Machines are being demonstrated in many war-busy plants where women workers are handling vitally important production on these fast, accurate machines. Shortage of manpower, therefore, need not be a handicap in plants where P & J machines are on the job.

The battery of P & J 8D Automatics with women operators shown here is helping keep a huge armament production program up to schedule in a well-known shop. Large forgings of tough materials are handled easily for such operations as turning, facing, boring, drilling, reaming, recessing, beveling and undercutting — another of many instances where P & J Automatics and P & J Tooling play an important part in turning out more and better work at lower cost and with less effort.



The **POTTER & JOHNSTON MACHINE COMPANY**

Pawtucket, R. I.

Bonds will Buy Airplanes Today—
and . . . Automobiles Tomorrow

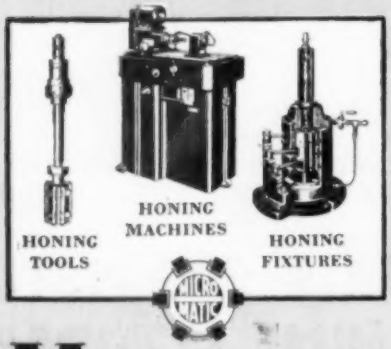
PHOTO COURTESY U. S. SIGNAL CORPS

Yesterday—*Gun ordnance manufacture was not yet an industrial art in Civil War times. Crude, cast gun barrels, lack of recoil mechanisms, and loose tolerance machining limitations made artillery fire a mechanically haphazard accomplishment.*

World War I introduced the dependably accurate precision of the French 75 mm. gun. It could take the roughest kind of field handling. It could always register on a target with only a few rounds, and thereafter remain registered under a high rate of fire.

PHOTO COURTESY "ARMY ORDNANCE"

Today—Tactical requirements of the present War have demanded new types of guns. They must fire heavier caliber shells faster, farther and for a longer time. They must outrange and out-fight all enemy guns. Increased muzzle velocities, better control of the shell trajectory, reduction of fouling of the lands and grooves of the rifling are all major requirements in modern high power, fast firing guns. These accomplishments are made possible by the hone abrading method of metal processing.



Microhoning

Helped develop the DEPENDABLE PRECISION of Modern Ordnance

Tomorrow—When at last peace may come again, the guns of industry must be accurately registered and rapidly demolish the many targets of pent-up demands for industrial goods. Time—and methods—will be of the essence. Microhoning will be ready with new developments offering substantial mechanical advancement and time saving over pre-war methods.

Microhoning is a process of finish machining which generates bore accuracy for roundness and straightness within .0002" to .0003"—which removes up to 65 cubic inches of stock per hour, has been developed into many ramifications, now being used for war machines. Tomorrow they will be available to speed peacetime production.

Micromatic HONE CORPORATION • Detroit 4, Michigan

MAKERS OF HONING MACHINE TOOLS

ANNOUNCING A NEW CONVENIENCE TO FIRTHITE USERS

Through new arrangements with hundreds of "authorized" Tool Makers located in every industrial center in the United States, they are now prepared to supply Firthite-tipped tools for quick delivery. We suggest that you contact your **REGULAR TOOL MAKERS** for Firthite Sintered Carbide. In case you do not immediately find the Firthite tool maker or distributor nearest you, any Firth-Sterling Office will gladly give you the name of "authorized" Tool Makers who will now supplement our own facilities.

ARMY E NAVY

Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. - NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

Makers of High-Speed Steels, Tool and Die Steels, and Sintered Carbides

PRODUCTION DOUBLED?

In the Case Shown Below Machine Production was Practically Doubled!

Another Cortland War Production Test in the plant of a manufacturer of grinding machines . . . Cortland Chucks and Segments against another brand of Sectored Cylinder Wheels . . . on a Blanchard No. 18 Vertical Surface Grinder; wheel speed 705 R.P.M.

WORK: Plate for Diamond Holder—cast iron; 76.5 sq. in. per piece; 7 pieces per table load.

Here are the Production Test results. Note the tremendous difference in performance of Cortland Chucks and Segments over the brand formerly used.

Detail	CORTLAND Chuck and Segments	*Competitive Brand of Sectored Cylinder*
Cubic inches of stock removed per inch in height of segments	1606.4	739.5
Ampere readings	85	66 - dress
Dressings necessary	None	5
Work heat?	No	No
Grinding time	6 min.	11 min.

In addition to the greatly increased machine production, note that more than double the amount of stock was removed per unit of abrasive.

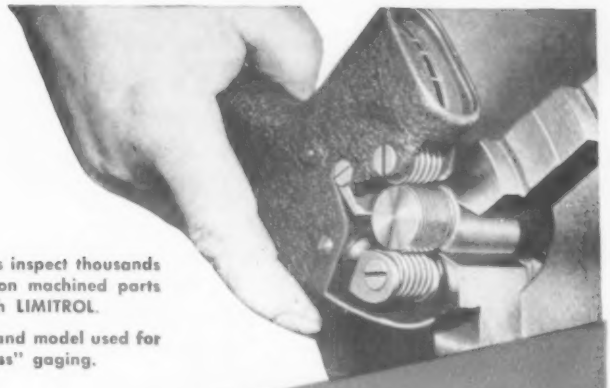
Why not investigate the possibility of improving the quality and quantity of your vertical spindle surface grinding production with Cortland Chucks and *Diagonal Shearing* Segments? Write for latest illustrated bulletin giving the complete story of Cortland's amazing performance.

CORTLAND GRINDING WHEELS CORP.
14 Cortland Street Chester, Massachusetts

Diagonal Shearing with Varying Contact Means Better Surface Grinding

A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

CORTLAND
Chucks and Segments



LEFT: Girls inspect thousands of precision machined parts daily with LIMITROL.

RIGHT: Hand model used for "in process" gaging.

6 Inspections in One

WITH LIMITROL

A NEW COMPARATOR GAGE BY WOODWORTH

VISUAL CHECKING OF:

1. Pitch Diameter
2. Lead
3. Taper
4. Out-of-roundness
5. Angle
6. Straightness

Write for Catalog 44-L

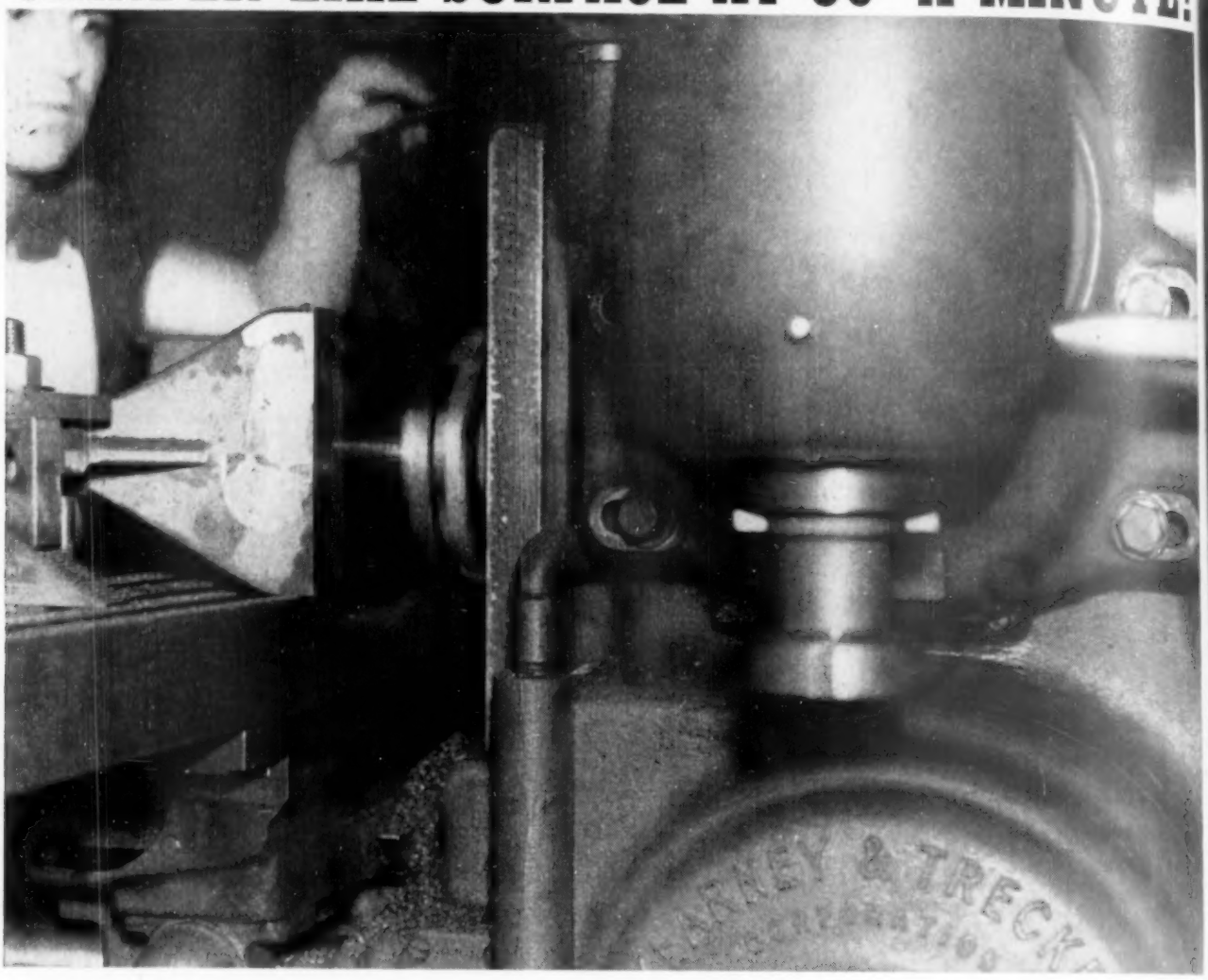
ACCURACY YOU CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • GROUND THREAD TAPS • FORM TOOLS • PRECISION MACHINED PARTS • HEAT TREATING • PLATING

GRINDER-LIKE SURFACE AT 30" A MINUTE!



Note the mirror-like surface produced by a Grayson 6½" Face Mill machining this hard Meehanite casting. The job here was stepped up from 4½ minutes per part to better than ⅔ of a minute per part— more than 7 parts to 1! The number of parts per grinding of the cutter was triple that obtainable before.

GRAYSON STANDARD CARBIDE CUTTERS

INCREASE YOUR PRODUCTION NOW — WHEN REQUIREMENTS ARE ACUTE!

The Grayson Manufacturing Company makes nothing but cemented carbide milling cutters — consequently it has an extensive technical knowledge of this highly specialized field. It is the first company to manufacture a *standard* line of solid-body (Meehanite) carbide cutters. Draw upon our valuable experience and background. Standard face mills, half-side mills, staggered-tooth mills, side mills and slotting mills are available in most cases for delivery within five days of your order.

U. S. AND BRITISH PATENTS PENDING

Grayson Manufacturing Company

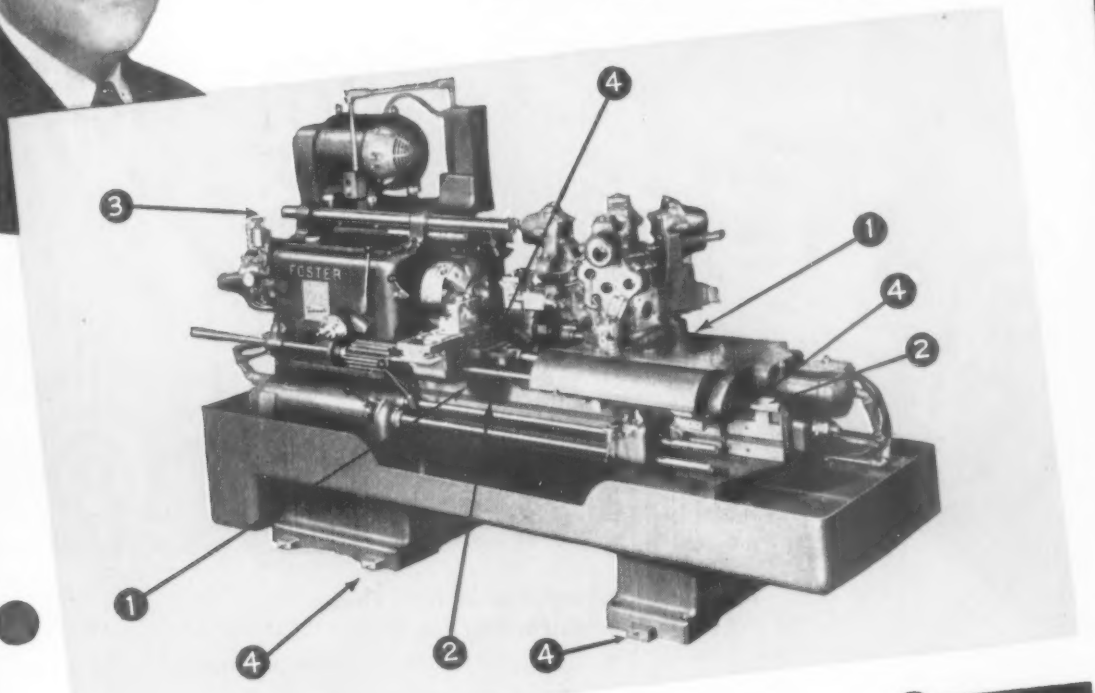
FACTORY AT MONROVIA, CALIFORNIA

MACHINE-TOOL TIPS FROM THE TOP-NOTCHERS

TURRET LATHES

"Careful maintenance of Turret Lathes can increase production, add years to their service life"

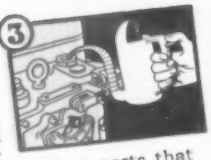
says Charles H. Foster, Vice-Pres. in Charge of Sales
International Machine Tool Corporation
Elkhart, Indiana



"Cleanliness is a vitally important factor in proper turret lathe operation. In cleaning the lathe, a brush should always be used. Never use an air hose, as it may blow chips and other abrasive material between bearing surfaces. Even comparatively non-abrasive materials, when combined with oil, may reduce lubrication or even pack tightly and interfere with working parts.

"Carriage wipers should be cleaned frequently and removed occasionally. If an oiled cloth is used for final wiping, it should be clean and free from lint. Don't use waste. This final wiping with an oiled cloth should be done whenever the machine is to be shut down overnight, as serious rusting and pitting often occurs due to acid perspiration from the operator's hands.

"Proper lubrication of the lathe is also important. The oil reservoir should be kept filled to the proper level at all times, and should be drained, re-filled and the filter cleaned, at least 3 times a year. Be sure not to neglect parts that require hand oiling.



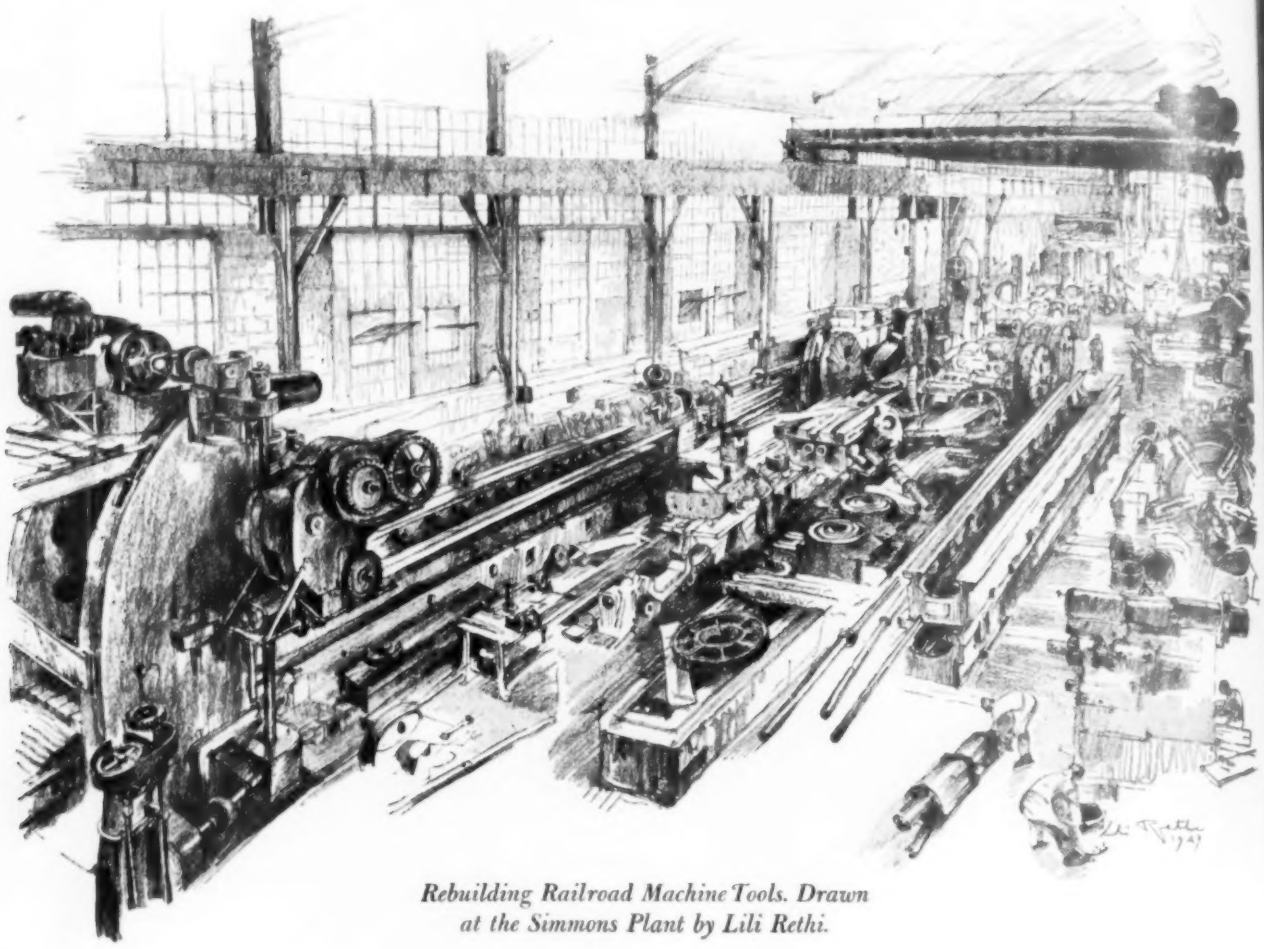
"Even on concrete floors, lathes should be mounted on a ½" steel plate to guard against the machine getting out of level due to settling floors, shifting floor loads or the installation of heavy machinery nearby. Check the leveling with a sensitive level (not an ordinary machinist's level) at least once a month. Also, tighten leg bolts occasionally. Errors of as much as 10/1000 in a 10" cut have been traced to the machine being out of level."

The selection of the proper cutting oil is as important as the proper maintenance of your turret lathes. Each is designed to do a specific job better than any other. And, when used without careful consideration of the job at hand, results in lost time, material waste, high rate of rejects. That's why Shell Lubrication Technicians have developed a control technique that "tailor-makes" the oil to fit the machine, the application, and the tool. Ask the Shell man for the details.

SHELL CUTTING OILS for metal cutting and grinding

SHELL

SO THE ALLIES MAY USE EUROPE'S RAILROADS



Rebuilding Railroad Machine Tools. Drawn at the Simmons Plant by Lili Rethi.

UNENDING TARGET of Allied airmen and underground sympathizers since war's beginning have been the railroads of Europe. To halt the flow of Nazi troops and supplies, terminals, freight trains and railroad shops have been bombed, dynamited and wrecked at every opportunity.

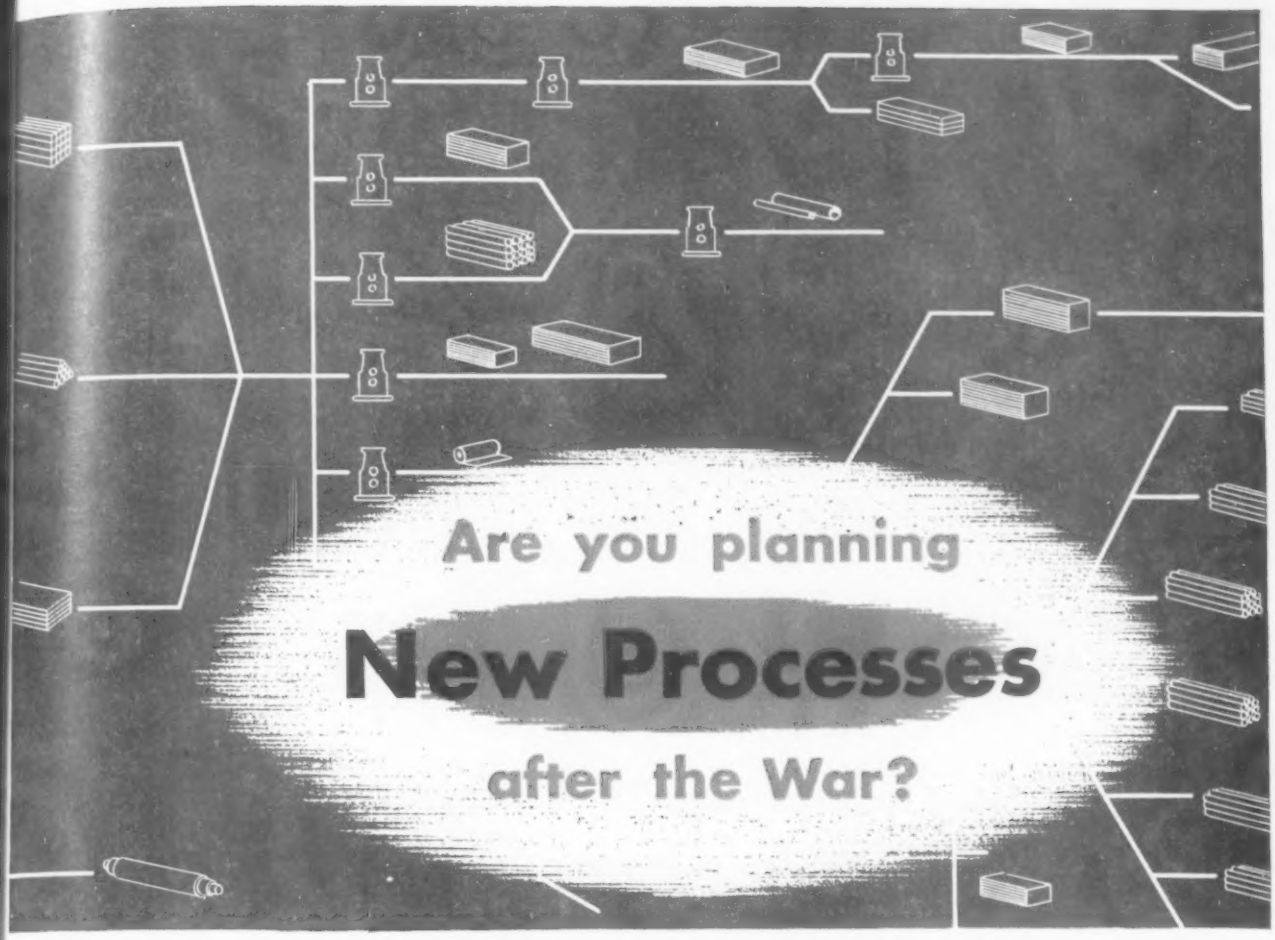
Because these same railroads are equally vital to the Allies as supply lines for the penetration of Hitler's Fortress, equipment for restoring them to operating condition is high on the vast list of materiel carried by invasion barges and ships. This means all types of heavy machine tools—railroad wheel lathes, planers, boring mills, among others.

Every available machine tool suitable for this purpose is being unearthed. Inasmuch as our own railroads, handling the heaviest transportation loads in their history, require similar equipment in great amounts, many of the machine tools acquired for the invasion of Europe were old and rundown. *Engineered Rebuilding* by Simmons, however, restored them to good operating condition.

Here, then, is just one example from many illustrating the complex nature of this Global War, the seemingly unending requirements. Thousands of miles behind the battle lines the materiel must be planned down to the last detail.

SIMMONS MACHINE TOOL CORPORATION
1810 North Broadway, Albany 1, N. Y.

SIMMONS *Engineered* REBUILDING



INTERESTING new processes are just over the horizon for many industries—employing new materials, producing new commodities.

Most of these new processes—including *yours,* no doubt—will require holes by the thousands or the millions in the future as heretofore. Holes drilled and reamed in multiples. Good holes, accurate holes—holes produced *for less money.* Cle-Forge High Speed Drills and Peerless High Speed Reamers can help you keep production up and costs down on any material.

"Cleveland" men can help you plan ahead—your ◆Industrial Supply Distributor can help you too.

He is trained in keeping you supplied with hundreds of different items needed in your daily production—he is trained to order ahead to save you from running short. Your Distributor is giving you a priceless lift today and will be still *better* trained to serve you in the years ahead.

Until the Emergency ends—and in all your peacetime operations to come—make it your business *always* to

Telephone your ◆I◆S◆D◆ FIRST!

◆C◆

ARMY NAVY — ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

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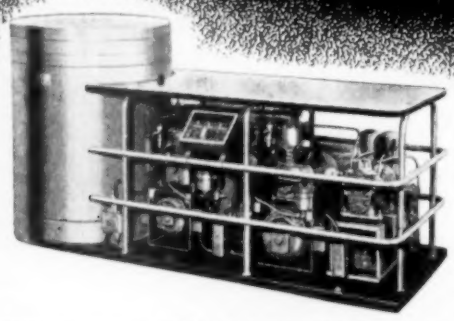
6515 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD.- 35-36-37 UPPER THAMES ST., E.C.4

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

A Factual Report on How Tool Users are Increasing Tool Life Through Cold Treating of Stock Tools . . . . .



(Above) Deepfreeze Cascade −120° F. Industrial Chilling Machine

Hundreds of tool users are today obtaining remarkable increases in tool life by using Deepfreeze Sub-Zero Temperatures for treating finished "ready to use" stock tools from the tool crib in their own plant. Hundreds of manufacturers are now using the Deepfreeze Cascade Industrial Chilling Machine on a practical production basis for cold treating of tools now on hand, all new tools before use, and all tools after each resharpening to restore original hardness of the actual cutting edges that may be slightly softened during resharpening operations. Here are the results direct from the field of a few actual tests made by various manufacturers on many types of tools.

Get This *FREE* Test on Your Tools . . .

If you would like to prove to yourself what this new cold treating process can do for your tools, send in a sample tool and let us cold treat it in a Deepfreeze Machine. Then run it in your own shop and check the results. Send only tools completely resharpened, ready for use.

More Proof—For additional proof on how the Deepfreeze Industrial Chilling Machine can be profitably adapted in your plant for the cold treating of cutting tools and many other applications, send for the new Deepfreeze Metal Chilling Book. This free book contains the complete and latest data on the use of the new cold treating process in industry today.

...Read How These Users Have Increased Tool Life

DRILLS

On $21/32$" drills used for drilling tank parts, the best possible result before cold treating was 70 holes per grind. Now, after cold treating at −120° F. in a Deepfreeze Cascade Industrial Chilling Machine, the average result of the stock drills is over 700 holes per grind.

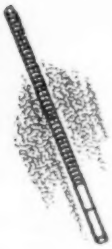
On another drilling operation on S.A.E. 4340 steel forgings with a Brinell of 387 to 407, standard stock $11/32$" drills have shown an increase of from 48 holes to 256 holes after cold treating for two hours at −120° F. in a Deepfreeze Industrial Machine.

TAPS

On a tapping operation, the life of the tap before cold treating averaged about 40 pieces per grind. Now, after subjecting these taps to −120° F. temperatures in a Deepfreeze, production per grind averages 710 pieces.

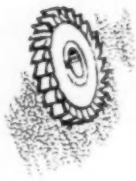
A screw machine job shop was having trouble on tapping operations on S.A.E. 4340 steel. The taps were constantly breaking and the material tearing. After cold treating both the taps and the unhardened material, the tap breakage was eliminated and better threads were obtained.

BROACHES



After cold treating high speed burnishing broaches at −120° F. for 3 hours, an increase of from 216 pieces to 648 pieces per grind was obtained.

MILLING CUTTERS



On a gang milling operation on a 4340 steel forging with a Brinell of 387 to 402, it was formerly necessary to resharpen the cutters every 7 hours. Now, after cold treating for two hours at −120° F. in Deepfreeze, the average life of these cutters is 24 hours per grind.

On a continuous milling operation a manufacturer formerly obtained 10 to 12 pieces per grind. Now, after chilling in Deepfreeze at −120° F. from 38 to 44 pieces per cutter grind are obtained.

SAWS

On a sawing operation on $5\frac{3}{4}$" round Mehanite cast bars, a 100% increase in cutter life between sharpenings was obtained after cold treating for two hours at −120° F. in a Deepfreeze Machine.

Another shop was having trouble with Moly High Speed hack saw blades. After chilling at −120° F. for a period of 3 hours in a Deepfreeze Cascade Machine, the life of these blades was increased more than 119%.

FORM TOOLS

On a form cutter used for forming the complete tooth section on a differential side gear machined from a 4820 steel forging, the best performance before cold treating was 150 pieces or 6 hours tool life. Now, after treating for 2 hours at −120° F. in a Deepfreeze, this tool will run 2 days and 2 nights, averaging 510 pieces before resharpening is required.

Deepfreeze

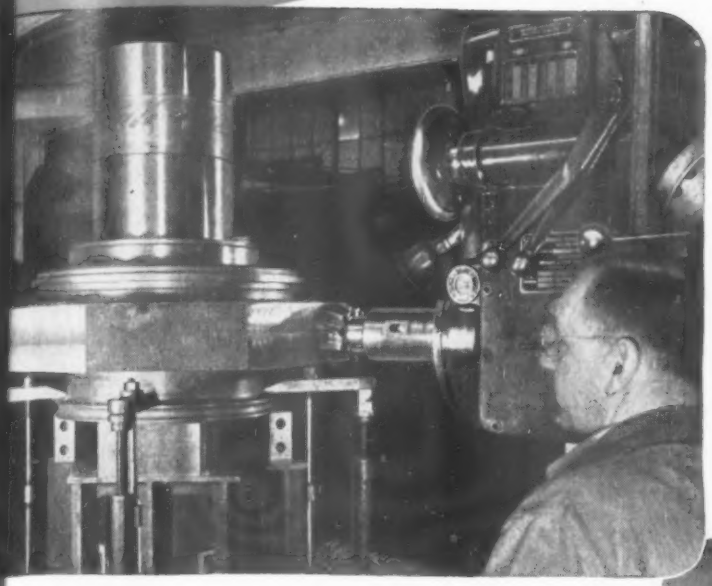
2311 DAVIS STREET
NORTH CHICAGO, ILLINOIS

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Division of Motor Products Corporation, Detroit, Michigan

HOW TO MAKE USE OF THE "BUILT-IN" ACCURACY OF YOUR G. & L. HORIZONTAL



Accurate Bore-and-Face Relationship Obtained Automatically with a G. & L. Rotary Table

Without effort or trouble, it is possible to hold close tolerances with your G. & L. Horizontal Boring Machine equipped with a built-in rotary table.

On this job, for instance, both the milled surfaces of the octagon and bored holes are held to within ±.001" of each other. There's no need of checking and re-checking between indexes because the rotary table can be indexed to within ±.0005" using dial indicator and stops.

Perhaps you are doing jobs that could be done quicker and more accurately by using a G. & L. Rotary Indexing Table on your boring machine.

Call in one of our engineers to study your work and make recommendations. There is no obligation.

1st SETTING

Part is mounted on the rotary indexing table as shown.

1st Operation
ROUGH MILL FACES OF OCTAGON. Rotary table is indexed 45° between operations.

2nd Operation
Finish mill the faces.

3rd Operation
Drill 1¾" diameter.
Drill 1 5/16" diameter for elongated slot. (*See view at right.*)
Drill 2½" diameter—two passes.
First Pass—1⅝" drill.
Second Pass—2⅜" drill.
Rough bore 3 25/32" diameter.
(Repeat these operations for each face of the octagon.)

4th Operation
Finish bore 1.750", 2.500" and 3.781" diameters.

5th Operation
Finish bore and ream 1" diameter in elongated slot.
End mill to elongate slot.

6th Operation
End mill 15" radius on top and bottom of corners of octagon section. (*See view at right.*)

2nd SETTING

The part is turned 90°, mounted on blocks and clamped to the angle plate.

7th Operation
Drill ¾" diameter.
Ream to .750".
Move table for operation No. 8.

8th Operation
Drill for ½"–13 tap—hand fed, to permit retraction of the drill to clear chips and tap.

(Repeat these operations for every face of the octagon.)

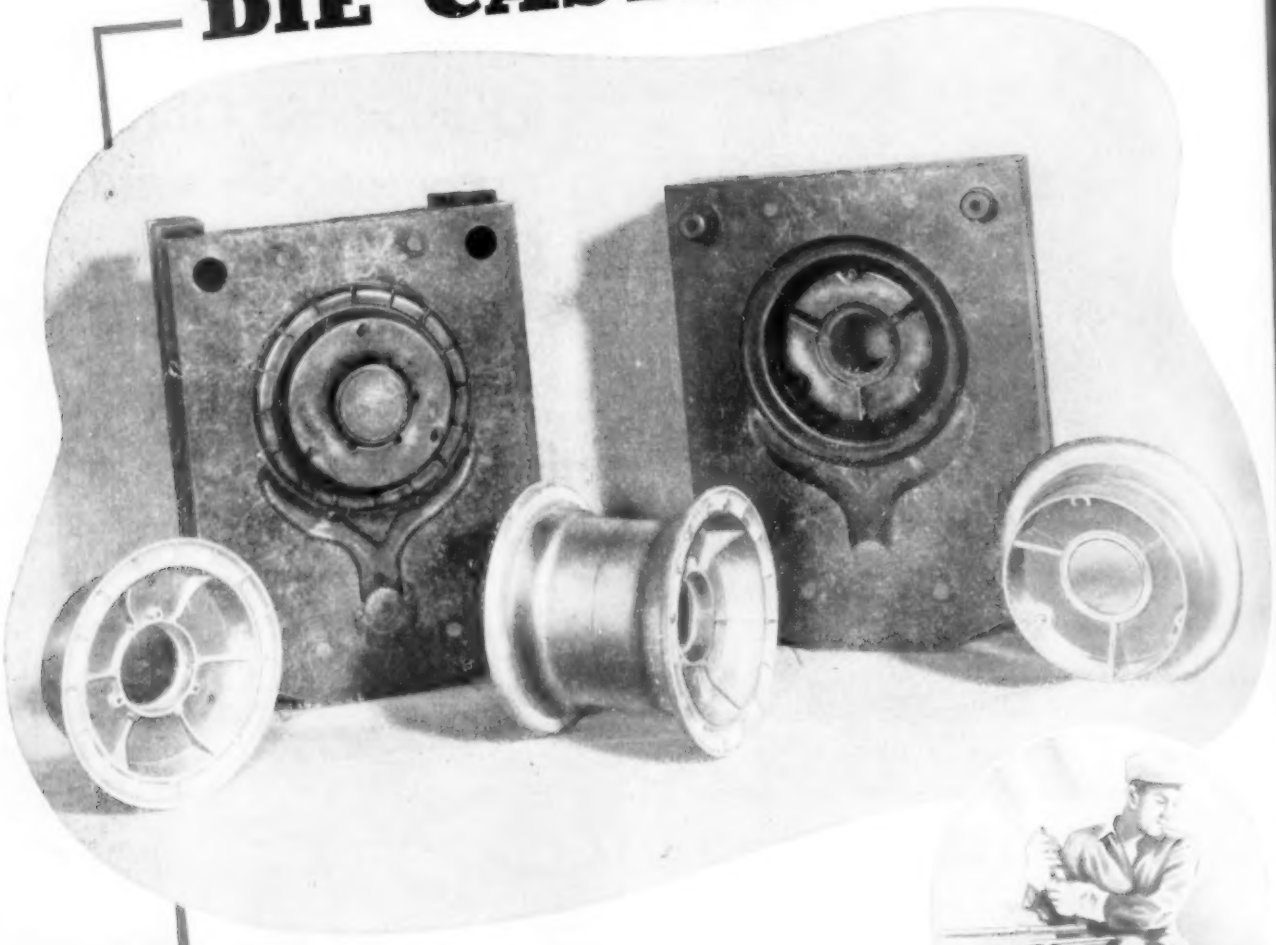
Additional Data

...covering the complete line of Giddings & Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin No. TE44.

GIDDINGS & LEWIS MACHINE TOOL CO.

100 ROLL STREET, FOND DU LAC, WISCONSIN

LATROBE
DIE CASTING STEELS



For Aluminum—
DYCAST No. 1
DYCAST
LUMDIE

For Zinc—
Z. T. DIE
Z. T. M.

For Brass—
C. L. W.

Latrobe Metallurgists and engineers are abreast of the most recent developments in the increasingly important Die Casting Industry, and their painstaking research is constantly directed toward the production of steels that will improve die performance.

Co-operation between customer and supplier is essential for real success in providing the correct steels to meet the requirements in this field . . . to this can be attributed the results obtained with Latrobe's Die Casting Steels for Aluminum, Magnesium, Zinc and Brass.

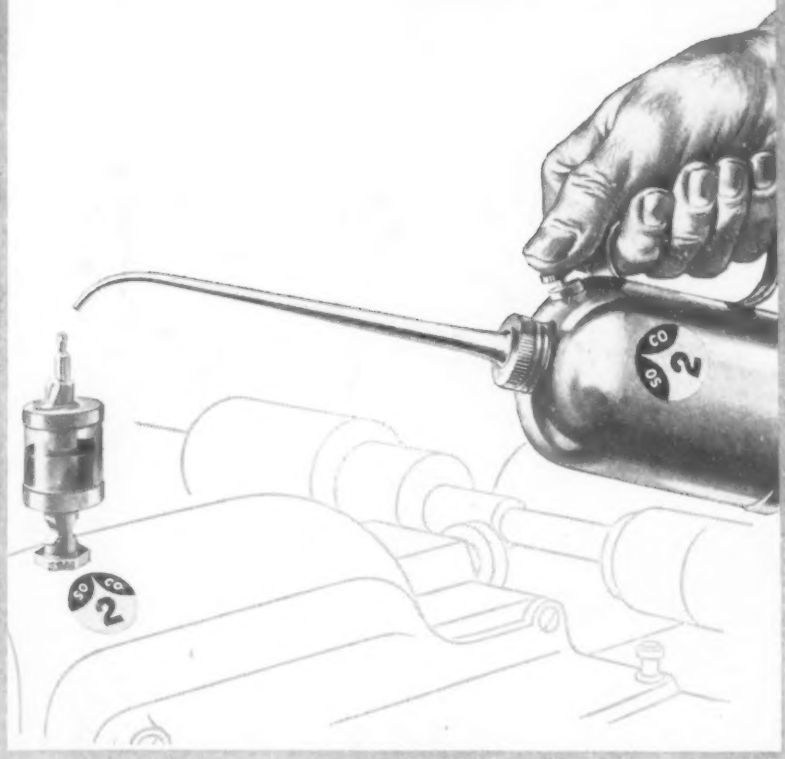
We will be glad to give you, without obligation, technical advice on your die-casting steel problems. Write.

LESCO

Latrobe ELECTRIC STEEL COMPANY
MAIN OFFICES *and* PLANT •• LATROBE • PENNSYLVANIA

2

It's "Blunder-proof"



Announcing . . .

Standard Coded Lubrication Service

. . . planned to get the right lubricants to all the right places!

No one knows better than the man in charge of your lubrication, the *need* for this simple, "blunder-proof" coded system.

Each separate lubricant used in your plant is given its own code number. *Every* lubrication point requiring that particular lubricant, and *every* container or device handling the servicing lubricant is clearly marked with a bright decalcomania transfer bearing its code number.

When this simple code system is followed, no point of lubrication can receive the *wrong* lubricant—points requiring lubrication are easier to see—less reliance must be placed on the memory of your oilers.

Standard Coded Lubrication Service is carefully planned to simplify, not complicate your lubrication problems. It not only makes easier and more effective the work of your oiler crews—makes inexperienced oilers almost as reliable as old hands—but also, it immediately clarifies and simplifies the efforts of the *men in charge* of this important part of your operations.

This Coded Service is at *your* service—without cost—if your plant is located in the Middle West.

Considerable advance demand was created when this plan was first submitted to representative industrial groups. Materials are being produced as fast as wartime conditions permit. We suggest you get your request on file at your nearest Standard Oil office.

Oil is Ammunition . . . Use it Wisely

FREE BOOKLET TELLS HOW

this simple code system may be fitted to your lubrication plan:

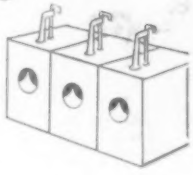
Flexibility and adaptability are outstanding features of this system. Note that it is a *numerical* system not to be confused with complex "color scheme" systems. Here are the few simple steps in this plan. A code number is assigned to each lubricant in your plant. Numbered decalcomania transfers are furnished by us in quantities sufficient to be applied to:

—every point of lubrication on every machine

—every grease gun or oil can used in servicing equipment

—every container or drum on your lubrication cart where they are used

and every barrel, drum, or storage tank in your oil house.



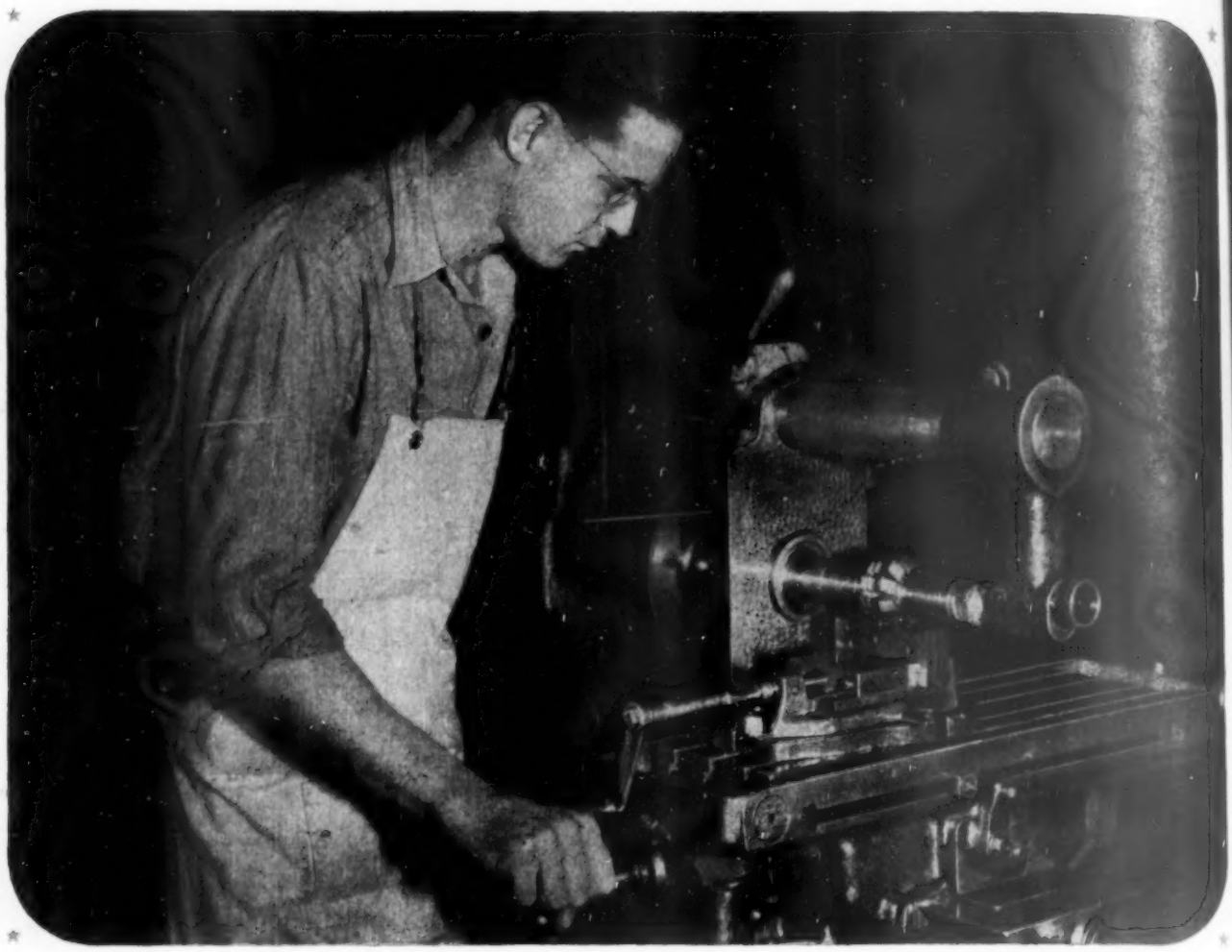
Machine Record Cards: Where desired, a supply of machine record cards (4"x6") is provided.

Lubrication Chart: For control purposes, a card is provided to list, by brand name and code numbers, all lubricants used in the plant. This card is used by stock clerk or stockkeeper to enable him to requisition products by brand name, and to mark barrels with the correct code numbered decal.

This Booklet gives full details of how Standard Coded Lubrication Service can go to work in your plant. Ask your Standard Oil Man for a copy. Talk it over with him and the men in charge of your lubrication. See how this plan fills a gap in your lubrication program. Call the nearest Standard Oil Company (Indiana) office, or write 910 S. Michigan Avenue, Chicago 5, Illinois. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING



Check these Main Points

WHEN YOU'RE MACHINING STAINLESS STEEL

Have you a copy of the Allegheny Ludlum "Fabrication Blue Sheet"?

Contains a wealth of reliable, certified data, not only on the machining of Allegheny Metal, but on the best methods employed in other fabrication operations on stainless steel—forming, welding, finishing, etc. Write for your copy—you'll find it highly useful and complete.

ADDRESS DEPT. TE-22

COME war or peace, stainless will always be a critical material *in the shop.* You'll want to keep rejects and spoilage low, as well as machining time and cost—and there are ways to do it.

Cutting speeds can't be as fast as with carbon steel or low alloys. Tools should be high speed steel or carbide-metal tipped, with a generous rake and a chip breaker, if possible. Keep them sharp, and don't allow the tool to ride on the work, to avoid work-hardening.

More important, check the design of the cutting tool itself, and check the possibility of using one of the special easy-machining grades of Allegheny Metal. Let us help you also to select the right cutting tool from the complete range of Allegheny Ludlum High Speed Steels and Carmet Carbide Tools.

AL

STEEL FOR THE NATION'S WELFARE

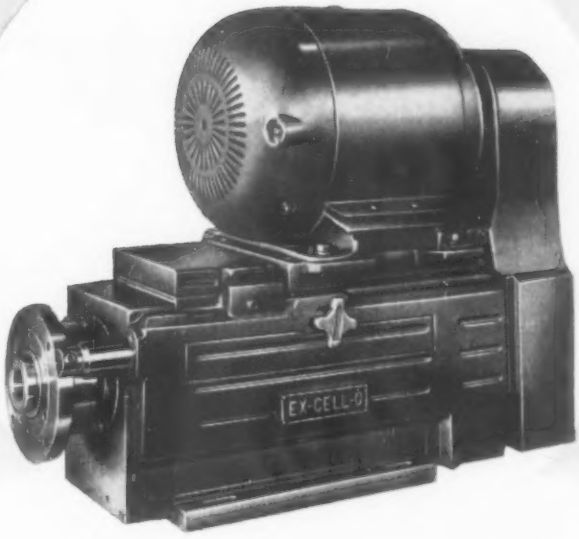
Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: BRACKENRIDGE, PENNA.

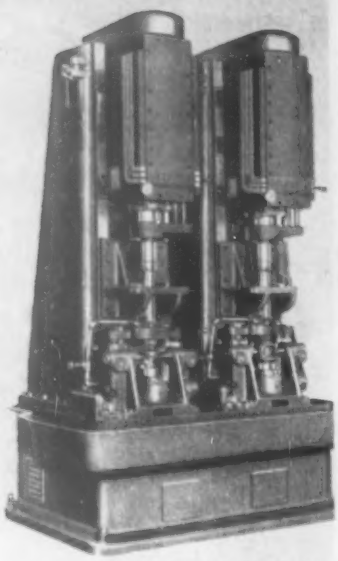
A-9294 ... W & D *Branch Offices in Principal Cities . . . Allegheny Metal also handled by all Joseph T. Ryerson & Sons, Inc. Warehouses*

XLO

EX-CELL-O *for* PRECISION

Here is shown an instance where the Ex-Cell-O Small Hydraulic Unit (Style 21) is used on a machine for the accurate drilling of holes in oil pump bodies.





On this Ex-Cell-O double drill press, two Style 25-A Ex-Cell-O Hydraulic Units are mounted on the columns in vertical position. This has definite advantages on certain classes of work.

Plan Now for ECONOMICAL PRODUCTION!

Production Machines equipped with Ex-Cell-O Hydraulic Units have numerous advantages

For the machine you build, or the machine we build, the use of Ex-Cell-O Hydraulic Power Units provides these features:

They are compact, for proper design.
They are self-contained, for ease in installation.
They have infinite feeds, for proper cutting.
They have gear change, for proper speeds.
They have ample power, for multiple-head operation.
They have variable stroke, for greater flexibility.

Ex-Cell-O Hydraulic Power Units are standard and produced in quantities, but in nearly every case where the unit is used it becomes a part of a special, high production type machine for a specific operation. These units are economical because, as applications change, the units can become a part of the new machine even though entire base is redesigned.

The units can be mounted on any plane—horizontally, vertically, or angularly—on a temporary or a permanent base, and they can be arranged so that it is possible to use them in connection with guide bars and multiple drill heads.

Find out today how Ex-Cell-O Special Machines and Ex-Cell-O Hydraulic Power Units can fit your program for today's and tomorrow's production.

Where high production, accuracy, and economy through multiple operations are required—consult EX-CELL-O now

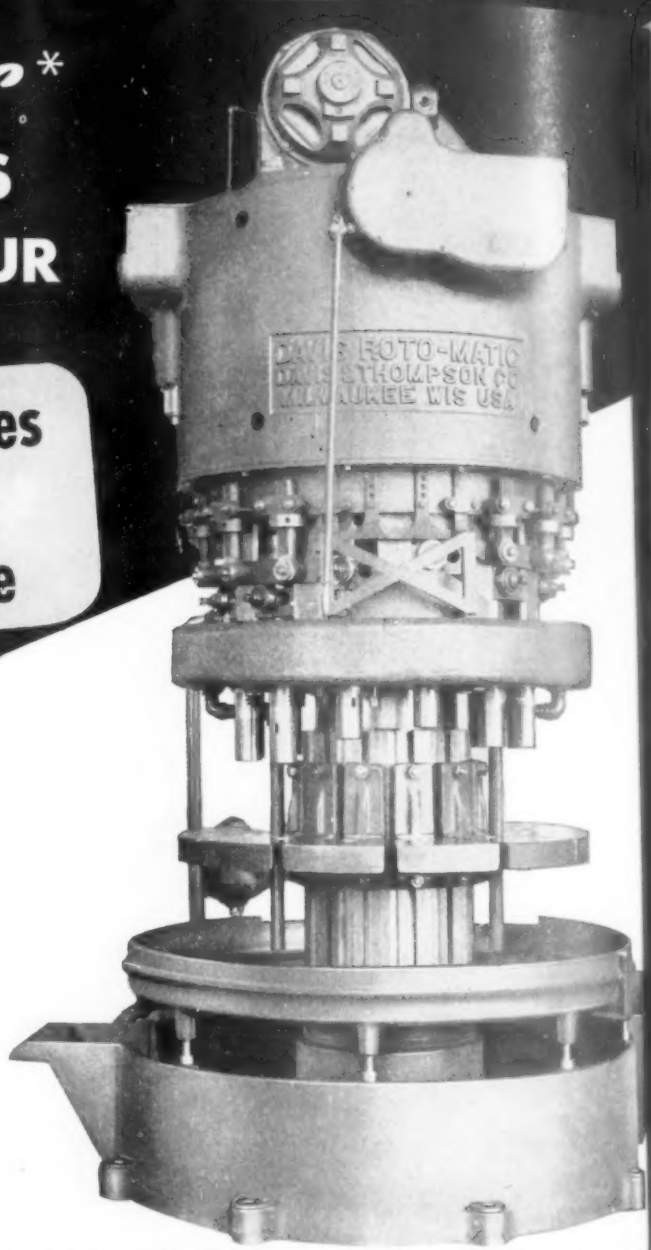
EX-CELL-O CORPORATION

DETROIT 6, MICHIGAN

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES BROACHES • HYDRAULIC POWER UNITS • GRINDING SPINDLES • DRILL JIG BUSHINGS • CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PURE-PAK CONTAINER MACHINES • PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

WHY *Roto-Matic** DRILLING MACHINES WILL INCREASE YOUR PRODUCTION

The *Roto-Matic** Operates on an Entirely Different, Time Conserving Principle



(Above) Basic Standard Davis & Thompson Vertical Roto-Matic Drilling Machine. Fixture and tooling are the only special engineering required to adapt this machine to an endless variety of work.

● Davis & Thompson Roto-Matic Drilling Machines are designed and constructed for high-speed, quality production. Operation is continuous from the minute the machine is put into action until the job has been completely run. No stops or slow-downs are required, even for unloading and reloading. This operation is readily accomplished by the operator as the completed workpieces pass the loading station. Delays so common to conventional indexing-type drilling machines are eliminated entirely on the Roto-Matic. It will set the pace that will enable you to meet and exceed your toughest production schedules.

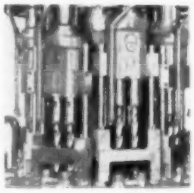
The Basis of the "*Roto-Matic** Principle"

Continuous operation is the basis of the Roto-Matic Principle. It is a multiple-station non-indexing-type machine. Work and spindles alike, rotate continuously about the drum with the desired operation being performed as they revolve. The average workpiece is readily machined in one revolution. Production is unaffected by unloading and reloading. Thus, on a Roto-Matic Drilling Machine every second of operating time is fully utilized.

Vertical and Horizontal *Roto-Matics**

Both Vertical and Horizontal Roto-Matics are available. They are basically standard machines, designed with sufficient flexibility to permit them to be adapted to various types of work. The Roto-Matic best suited to any particular job will depend upon the size and shape of the work itself, and the operation to be performed. In addition to drilling, these machines can be applied to milling, reaming, counterboring, spotfacing, balancing correction drilling and other similar operations. Consult us and we will be glad to explain how the Roto-Matic can be applied to your particular type of work to increase production. Your inquiry will not obligate you in any way.

Can Be Furnished With Multiple Spindle Heads



Roto-Matic Drilling Machines can be furnished with multiple spindle heads in each station. Illustrated here are two typical combinations: a vertical machine equipped with two spindle heads and one equipped with eight spindle heads. As many as twelve spindle heads can be used, permitting a maximum of 96 operations with every complete revolution about the drum.

Free Booklet—A booklet, containing detailed descriptions of Roto-Matic Drilling Machines is available and will be sent to you upon request without cost or obligation. It will be to your advantage to learn of the many additional advantages that Roto-Matics have to offer. Write today for Bulletin TE-444.

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DAVIS and Roto-Matic THOMPSON

Davis & Thompson Company

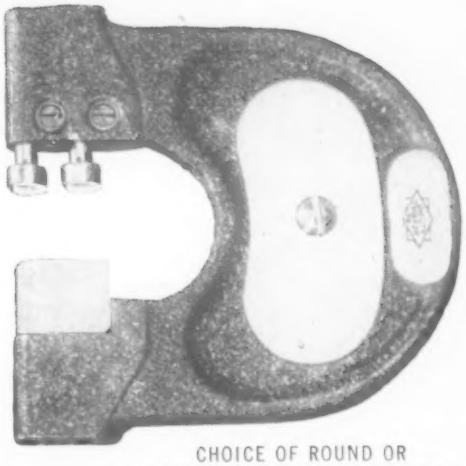
MILWAUKEE • WISCONSIN

QUALITY ADJUSTABLE LIMIT SNAP GAGES PROVIDE ACCURACY *and* SPEED *in* GAGING

A.G.D. MIDGET Adjustable Limit Snap Gage

Quality A.G.D. Midget Snap Gages are designed for greater ease and speed in gaging small parts. Light in weight (approx. 3 oz.), sensitive and with small contact surfaces (diameter of gaging buttons and width of anvil ¼"), they are superior to heavier type gages for making measurements close to a shoulder or in close quarters.

Available in sizes from .000 to .760



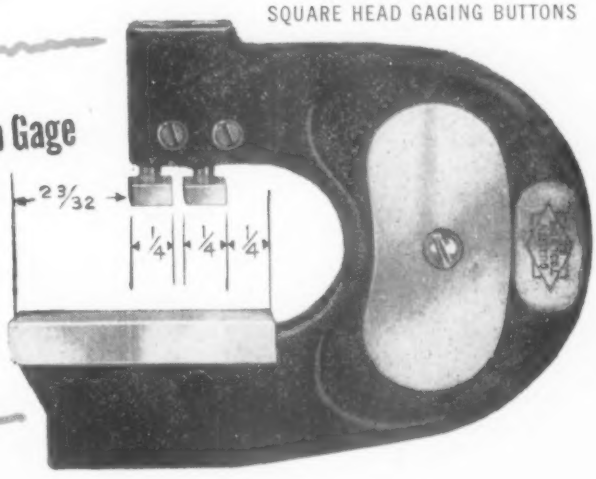
CHOICE OF ROUND OR SQUARE HEAD GAGING BUTTONS

Write for Illustrated Price List

"KWIK-CHEK" MIDGET Adjustable Limit Snap Gage

Odd and irregular shaped work may be easily and accurately checked with a Quality "Kwik-Chek" Midget Gage. Note the extension of the anvil which allows proper lining up of work before presenting it to the gaging buttons. Provides real speed-up of hand checking.

Available in sizes from .000 to .760



QUALITY TOOL & DIE CO.

Speed Victory... BUY WAR BONDS

405 N. NOBLE STREET — INDIANAPOLIS 2, INDIANA

Manufacturers of "QUALITY" Products

SOUTH BEND LATHES

FOR CLOSE TOLERANCES AND SMOOTH FINISH

To meet war production demands, close tolerances and smooth finishes must be maintained without sacrificing output. Machine tools must have the accuracy, speed, and rigidity required for the efficient machining of exacting work.

These are the kinds of jobs for which South Bend Lathes are designed. The smooth operation, wide range of spindle speeds, power, dependable accuracy, and rigid construction of these lathes enable them to hold the tolerances and produce the finish that is required.

South Bend Lathes are made in both Toolroom and Engine Lathe types with 9", 10", 13", 14½", and 16" swings, which cover a wide range of work. Also precision turret lathes. Write for a copy of Catalog 100-C in which they are all described.

SOUTH BEND LATHE WORKS

Lathe Builders for 37 Years — **South Bend 22, Indiana**

Specifications

Swing over bed . . 10⅜"
Spindle bore . . . . 1⅜"
Maximum collet capacity . 1"
Thread cutting feeds (48)
. . . 4 to 224 per in.
Spindle speeds (12)
. . 50 to 1357 r.p.m.
Power longitudinal and
cross feeds . . . 48

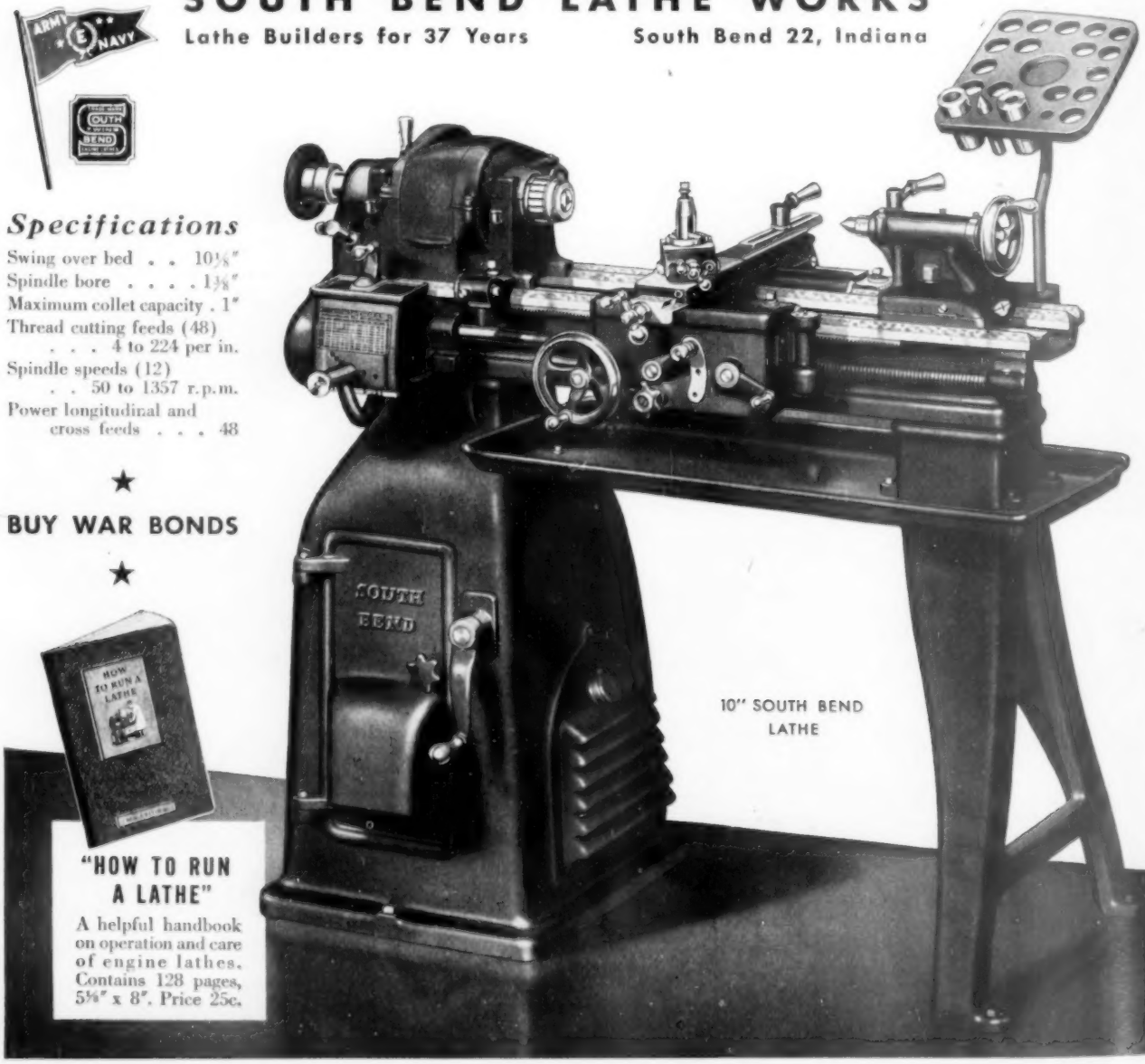
★

BUY WAR BONDS

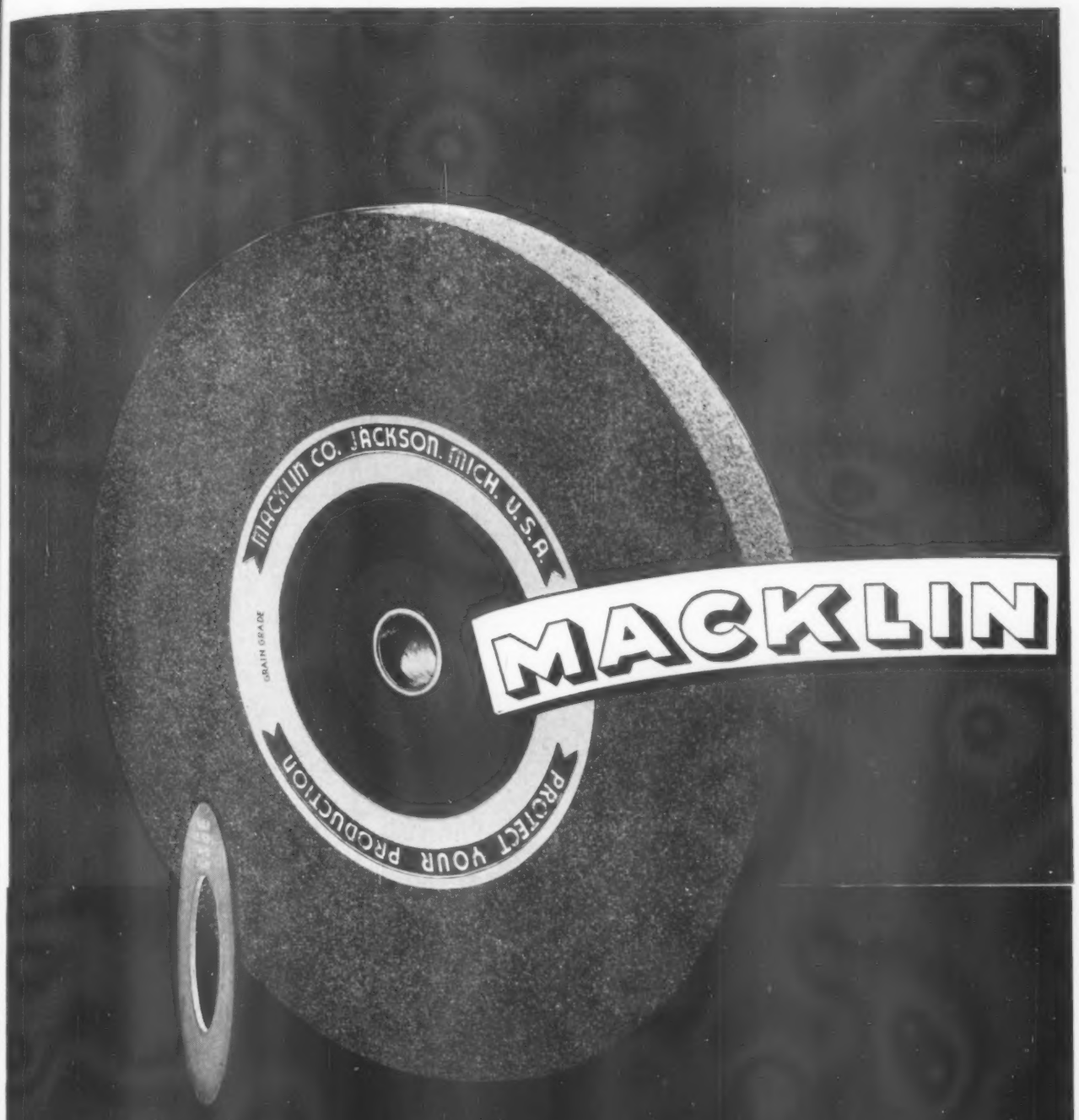
★

"HOW TO RUN A LATHE"

A helpful handbook on operation and care of engine lathes. Contains 128 pages, 5⅜" x 8". Price 25c.



10" SOUTH BEND LATHE



Macklin Thread Grinding Wheels are tops. No job too tough. They give best results, hold the close tolerance with less dressing and give longer wheel life. Let Macklin solve your thread grinding problems.

MACKLIN HIGH QUALITY WHEELS FOR EVERY GRINDING PURPOSE WILL

"PROTECT YOUR PRODUCTION"

Ask for the services of a Macklin Field Engineer

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

STEPS UP PRODUCTION OVER 300%!

New Completely Automatic Besly Grinder Speeds Accurate Parallel Surface Grinding

The Besly Vertical, Spindle Grinder No. 953 is the very latest development in machinery for high speed parallel surface grinding. Replacing the older double horizontal spindle grinder which required 5 or 6 passes per part with wheel adjustment after each pass, this new machine grinds the part to .001 inch accuracy for size, flatness and parallelism in one pass per side, without constant adjustment.

How It Operates

Before starting, the grinder is adjusted for the parts to be ground. The stools are arranged so that they alternate high and low, and the operator first drops the parts into the lower stools, where they are held in position for grinding by a clamp. The machine then grinds one side. As the piece comes around to the operator after being ground, he turns it over and sets it on the succeeding higher stool where the other side is ground to a tolerance of .001 inch.

Automatically Compensates for Wheel Wear

The grinder automatically compensates for wheel wear *as the machine is in operation.*

When the grinding wheel needs dressing, merely pushing a button does it automatically—a new feature which greatly reduces maintenance time and saves labor!

Progress in Besly grinder design has been rapid. As a result many new uses for grinders have been successfully developed. Ask us to give you information on Besly grinders for accurate high speed production.

MORE THAN 20% OF THE NATION'S "E" HOLDERS ARE REGULAR BESLY CUSTOMERS

Charles H. Besly and Company were awarded the Army-Navy "E" on December 1, 1943, for their production and contribution to Production.

Charles H. Besly and Co. is pleased to announce that of 1556 holders of the Army-Navy "E" reported through December 1943, 294 are regular users of Besly products.

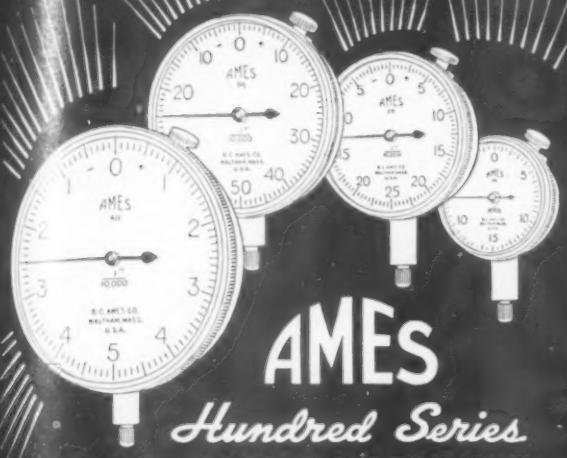
Send for this Booklet on Besly Titan Steelbac Discs—uniform, easy to mount, they speed output.

BESLY

BESLY GRINDERS AND ACCESSORIES
BESLY TAPS • BESLY TITAN ABRASIVE WHEELS

CHARLES H. BESLY AND COMPANY • 118 N. CLINTON ST., CHICAGO 6, ILL. • FACTORY: BELOIT, WIS.

4 Sizes ~ 14 Dial Faces



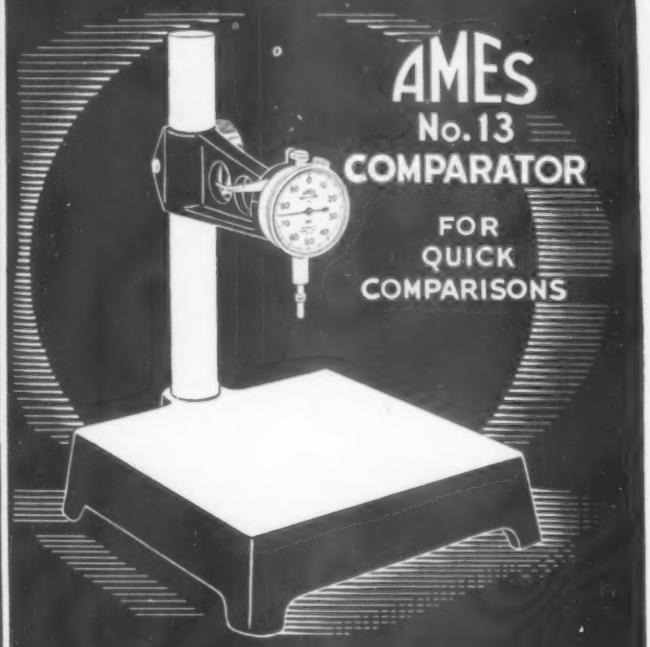
AMES
Hundred Series
DIAL INDICATORS

In four sizes with fourteen different dial graduations, indicating thousandths, half-thousandths or tenths of thousandths inches.

Speedy, accurate, inexpensive and adaptable to various measuring and testing jobs.

Write today for catalog.

FAST ◦ ACCURATE



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No. 13
COMPARATOR
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COMPARISONS

AMES Precision BENCH LATHE

Known for 40 years as a precision lathe of the highest quality. Bed 36" long. Ball bearing headstock uses 1" capacity collets. Swing 8 3/8" over bed. Available with motor drive.

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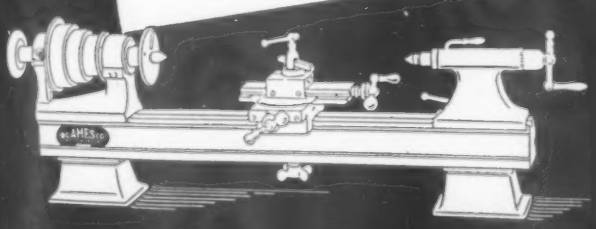


Shockless
in
Four Sizes

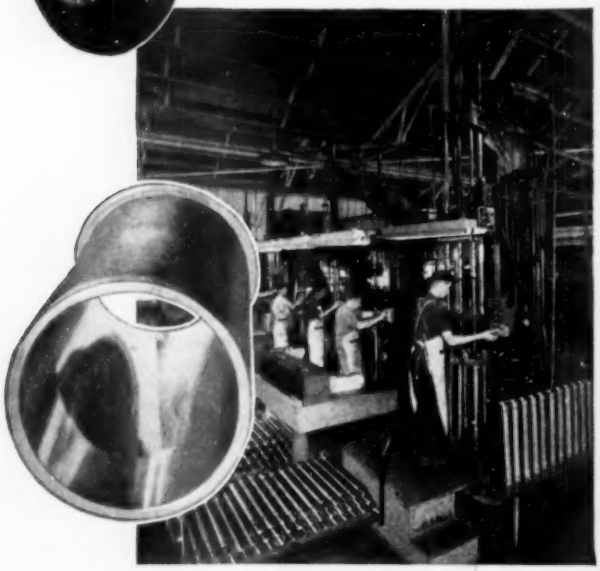
AMES
Hundred Series
DIAL INDICATORS

B.C. AMES CO. WALTHAM, MASS.

How Honing Provides "Aircraft Precision" in Finishing Operations

(Above) A battery of BARNESDRIL Honing Machines used for honing aircraft landing gear cylinders. Honed diameter is 3¼" x approximately 18" in length.

(Left) A typical retracting type landing gear used on one of our Navy's fighting planes.



(Above, left) A honed landing gear cylinder showing resulting mirror finish.

(Above) BARNESDRIL Honers used for finishing oleo tubes and landing gear hydraulic cylinders.

You can get complete facts about honing and our entire line of equipment in this free, valuable booklet. Write for Bulletin T-121.

Barnes Drill Co. 848-71 CHESTNUT STREET ROCKFORD ILLINOIS, U. S. A.

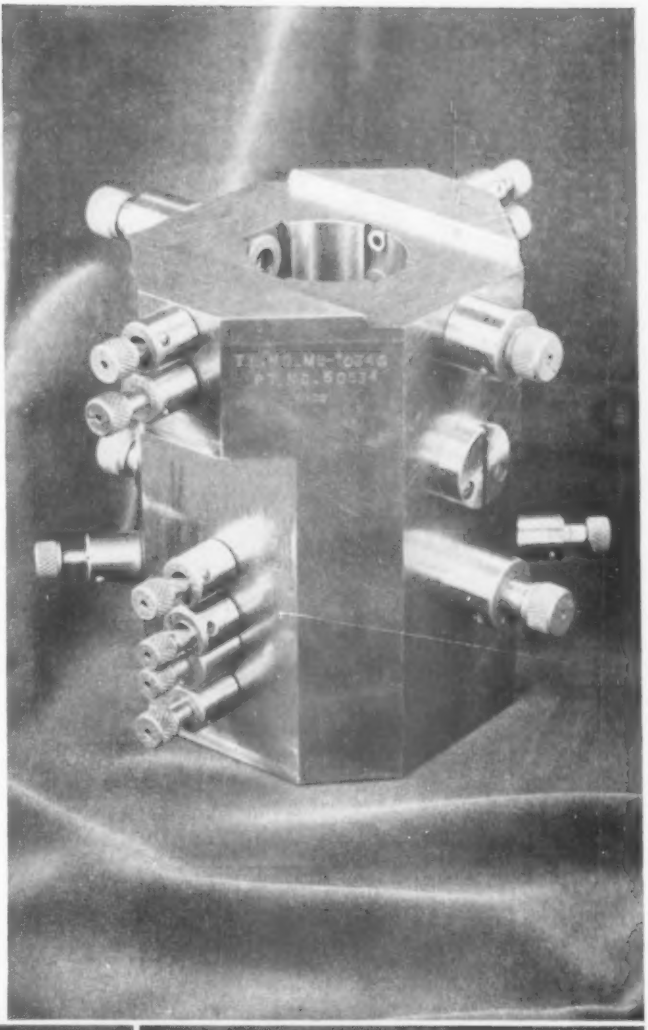
VERSATILE...

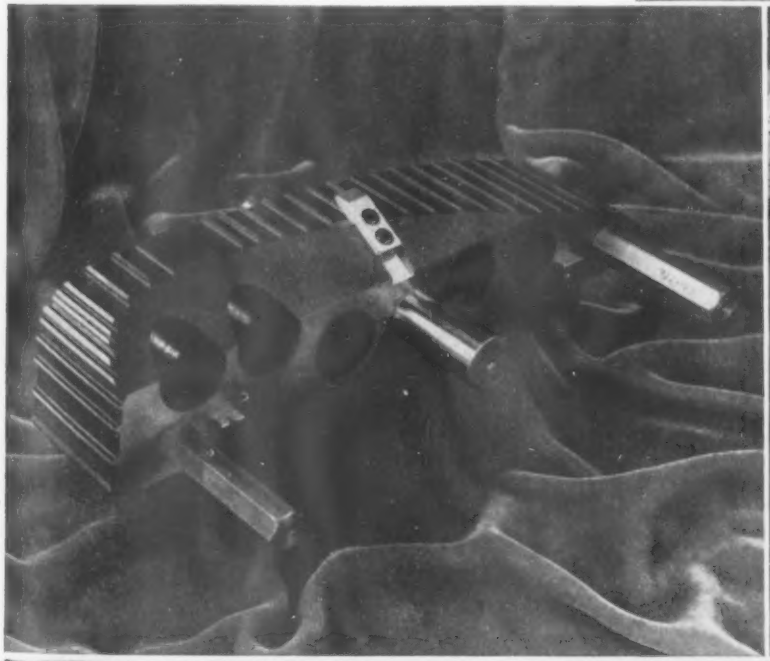
Sometimes a company gets a reputation for producing one particular item better than it can by made by others.

Vinco, pioneering involute splines and their inspection, is known, nationally, for the excellence and accuracy of the involute spline gages made here. Vinco's Involute Checker and Vinco's Dividing Head have been considered "tops" by many key companies using them.

But this is not all that Vinco excels in. Every type of fixed limit gage is made by Vinco with the same unerring skill; fixtures of many kinds and —well, the list is long and is partially shown at the bottom of this page. Look it over and you will probably see items you didn't know were made by Vinco. And remember that 1000 Vinco craftsmen work together to produce Vinco quality.

VINCO CORPORATION
8857 SCHAEFER HIGHWAY • DETROIT 27, MICH.
Sales Offices in NEW YORK and CHICAGO





MILLIONTHS OF AN INCH FOR SALE BY VINCO

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

THESE BARBER-COLMAN MEN ARE SOLVING YOUR CUTTER PROBLEMS

Perhaps the problem is how to increase production; how to combine several operations into one; improve finish; get greater tool life; or lower production costs. Whatever it is, it is being carefully analyzed to give you speedy help and satisfaction. The man on the right is a Barber-Colman field engineer. He has visited your plant, talked to you and your men, looked the job over on the spot. Many times, because of his experience, he might give you the solution right there. This time, however, he has brought the problem back with him to add further ideas.

As builders of production machine tools, we have had long experience with problems of how to make things better and faster. The benefit of this experience has been passed along to you before, in our hobbing engineering service. Now, we are going to offer you complete full-time consultation service on your cutting tool problems. The Barber-Colman field service has been expanded to offer this specialized help right in your own plant. When you are in trouble, when you want advice, or when you want to plan new things, call on this man and let him help you.

B-C ENGINEERING SERVICE

When we all convert to normal peace-time production again, there will be problems many-fold. There will be the question of new materials, new methods, new designs and new types of cutting tools. Which will be the best for your job? How can you get increased production in a shorter time and at lower cost? The purpose of this new extended service is to help you both now and when this time comes. Consult your B-C field engineer. He is ready to work with you.

Barber-Colman Company

GENERAL OFFICES AND PLANT • 105 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

NEW FOR ASSEMBLY FIXTURES—

MASONITE* DIE STOCK

Masonite Die Stock used in an assembly jig for a wing flap at Curtiss-Wright Corporation

MANY aircraft manufacturers today are using Masonite Die Stock in assembly fixtures where it will permit the reduction of the size of steel members.

There are three mighty good reasons why—this amazing, semi-plastic material cuts *weight, time* and *costs.*

Possessing inert qualities similar to metals—yet only one-sixth the weight of steel—Masonite Die Stock helps solve problems relating to rigidity, torque, deflection, expansion and retraction. And this smooth, durable material can be worked with either metal-working and cutting tools or with high-speed pattern shop equipment.

While its big success story is found in today's spectacular aircraft production, this modern die stock is also helping other fabricators of thin gauge metals do a *faster, better job at less cost and effort.*

Masonite Die Stock is available in thicknesses of ¼ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For more details, mail coupon.

*TRADE-MARK REG. U. S. PAT. OFF. "MASONITE" IDENTIFIES ALL PRODUCTS MARKETED BY MASONITE CORPORATION. COPYRIGHT 1944, MASONITE CORP.

MASONITE CORPORATION Dept. TE-4, 111 W. Washington St., Chicago 2, Ill.

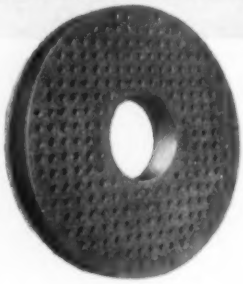
Please send me illustrative literature and complete information about Masonite Die Stock.

Name and firm _____

Address _____

City _____ *State* _____

GARDNER WIRE-LOKT ABRASIVES are *modern* CUTTING MEMBERS



How to handle your small parallel-surface jobs-*quickly!*

Two examples-

using a
No. 77A-12"
GARDNER
GRINDER

DOZENS of small parallel-surface jobs are being ground — RAPIDLY — on No. 77A-12" Gardner Double Spindle Grinders like the two shown in the accompanying "close-ups".

The rotary carrier method used in both cases, is particularly productive, but wherever production is moderate, hand-operated fixtures may be substituted.

Check your own parallel-surface parts, and investigate the possibility of GARDNER-GRINDING.

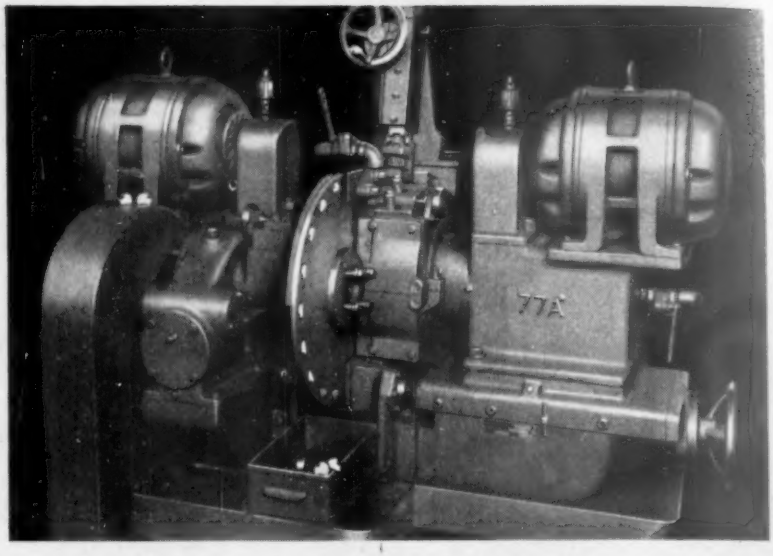


FIG. 1. Brass booster rotors, handled at the rate of 15 to 20 PER MINUTE, on this No. 77A-12" Gardner Grinder. Tolerances: .0005" to .001" for parallelism, and .002" to .003" for uniformity.

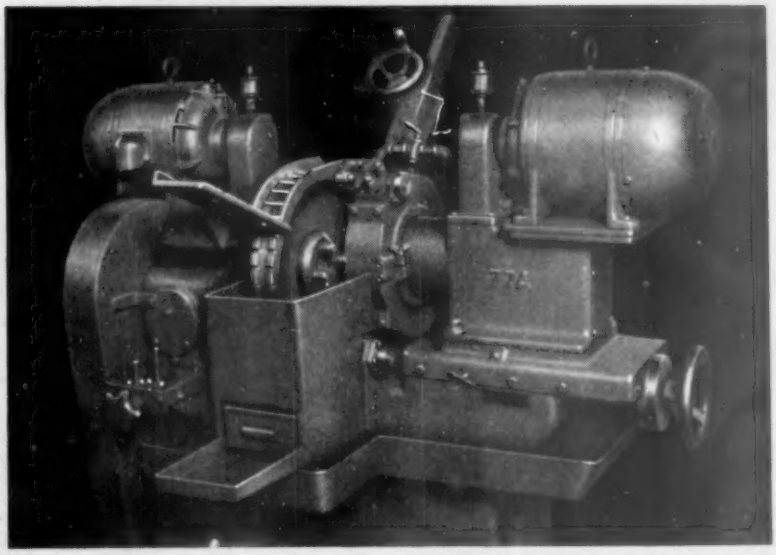


FIG. 2 Soft steel studs and pins, ¼" to ⅜" in diameter x 1" to 3½" long, ground on the ends. PRODUCTION: 15 to 30 per minute; TOLERANCES: .001" for squareness, and .002" to .003" for uniformity.

Write for data on DOUBLE-DISC GRINDING!

GARDNER MACHINE COMPANY
442 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.

SELF-LUBRICATING BRONZE BEARINGS at *37* POINTS*...

AND PRECISION, PRELOADED BALL BEARING HEADSTOCK

4 BEARINGS IN COUNTER-SHAFT
3 BEARINGS IN REVERSE GEAR BRACKET
11 BEARINGS IN GEAR BOX
6 BEARINGS IN HEADSTOCK
9 BEARINGS IN AUTOMATIC APRON
4 BEARINGS IN CARRIAGE ASSEMBLY

*Arrows indicate location and number of self-lubricating bearings in Logan Quick Change Gear Lathe. All Logan Lathes are similarly protected.

The day you install a Logan Lathe you end your worries about the constant oiling of vital parts. Take, for example, the Logan Quick Change Gear Lathe shown above. At 37 points where plain, oil-thirsty bearings are ordinarily furnished, this lathe gives you *self-lubricating bronze bearings*. Here is a feature of Logan advanced design which automatically eliminates a prime cause of breakdowns. Furthermore, the spindle on this and all Logan Lathes turns on precision, preloaded ball bearings that never need lubrication. This Logan combination of self-lubricating bronze bearings with precision, preloaded ball bearing spindle mounting forms another important reason why Logan Lathes are setting remarkable records for sustained accuracy . . . high speed, low cost production . . . longer machine life. Write today for the new catalog that gives you complete information on the advanced design features of all models of Logan Lathes.

Brief Specifications: . . . Swing over bed, 10½" . . . Between centers, 24" . . . Bed length, 43⅛" . . . Spindle hole, 25/32" . . . Precision ground ways: 2 prismatic V-ways; 2 flat ways . . . 12 spindle speeds, 30 to 1450 r.p.m.

Logan No. 200 Back Geared Screw Cutting Lathe with Self-Lubricating Bronze Bearings at 23 Points

Logan No. 850 Manufacturing Turret Lathe with Self-Lubricating Bronze Bearings at 19 Points

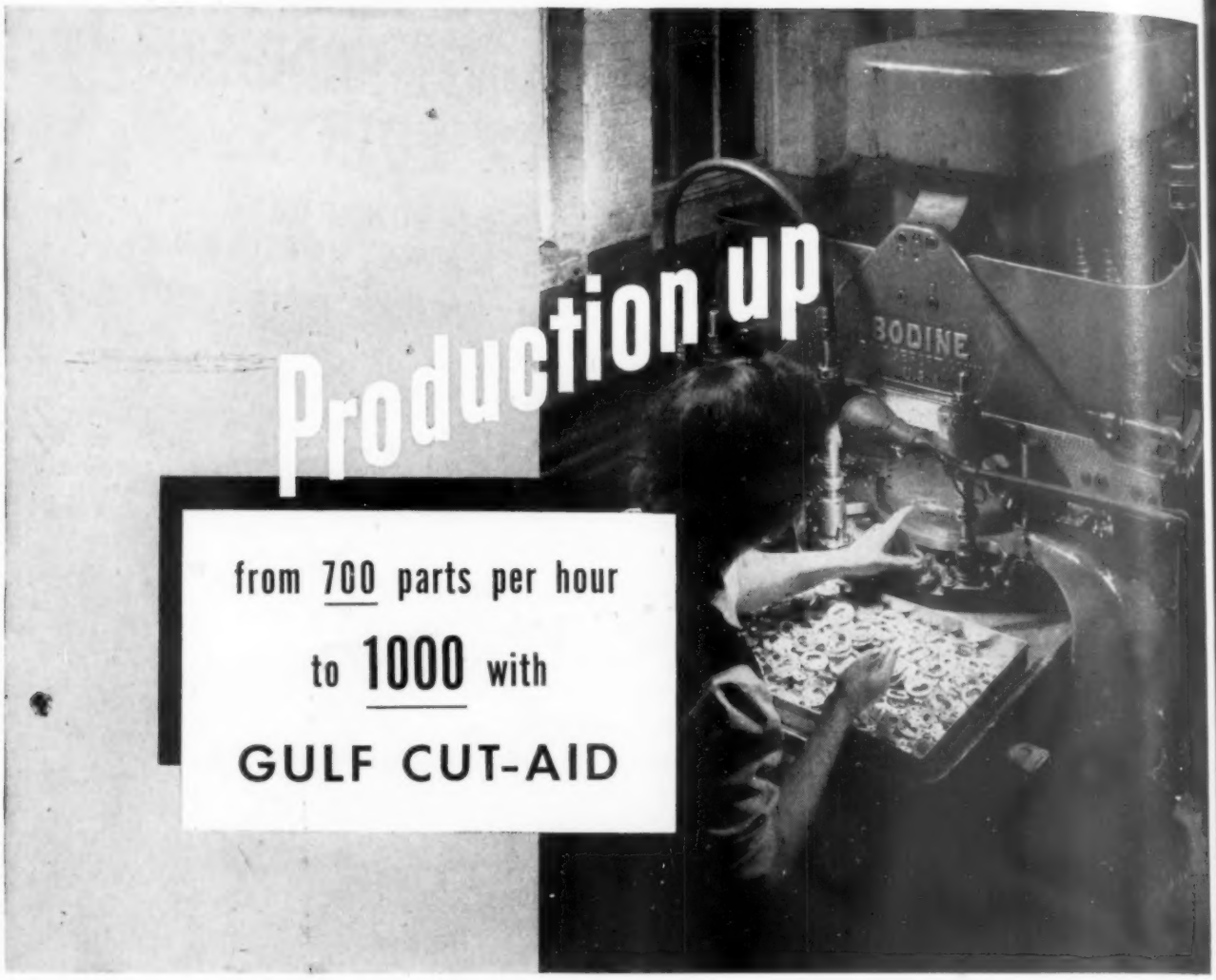
Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

LOGAN ENGINEERING CO.

Chicago 30, Illinois

One of a series describing the finer features of Logan Lathes . . . Look for the next of the series



This revolutionary new cutting oil consistently shows better results in machining nonferrous metals — it will pay you to investigate!

With soluble oil as the cutting fluid, this machine drilled and tapped 700 parts per hour. With Gulf Cut-Aid — no other changes — production is approximately 1,000 per hour . . . a gain of 43%!

This is typical of results with Gulf Cut-Aid on nonferrous metals. In scores of plants, this revolutionary new cutting oil has directly contributed to greater production, longer tool life, and better finishes.

Let a Gulf Service Engineer show you why Gulf Cut-Aid is the ideal cutting fluid for many of your nonferrous metal machining jobs. Write, wire, or phone your nearest Gulf office today.

Gulf Oil Corporation · Gulf Refining Company

Gulf Building, Pittsburgh 30, Pa.

GULF INDUSTRIAL LUBRICATION

THE FORBIDDEN ROOM...

There are only six keys to the door, and the lock is often changed. . . . For this is a very private room. It is in the plant of one of America's greatest corporations, and behind the door to this inner sanctum part of the future is being made.

There are literally hundreds of "forbidden rooms" in America today, where the plans, the designs, the mock-ups and models are being made for countless new products and machines—from giant electrical power plants, still in the experimental stage, to table-model television sets, now a solid post-war certainty.

Few outsiders ever enter this inner circle . . . but one of these is the machine tool engineer.

For equally as important today as any brilliant new design is the *cost of manufacture*—and it is here that the machine tool engineer comes in. Leading manufacturing executives know that this factor of cost is going to be more important, in the fast competition of the post-war period, than ever before in history.

It is because of this that Jones & Lamson engineers are being taken into their conferences and their confidences: helping them to plan complete production line set-ups for the day this war ends.

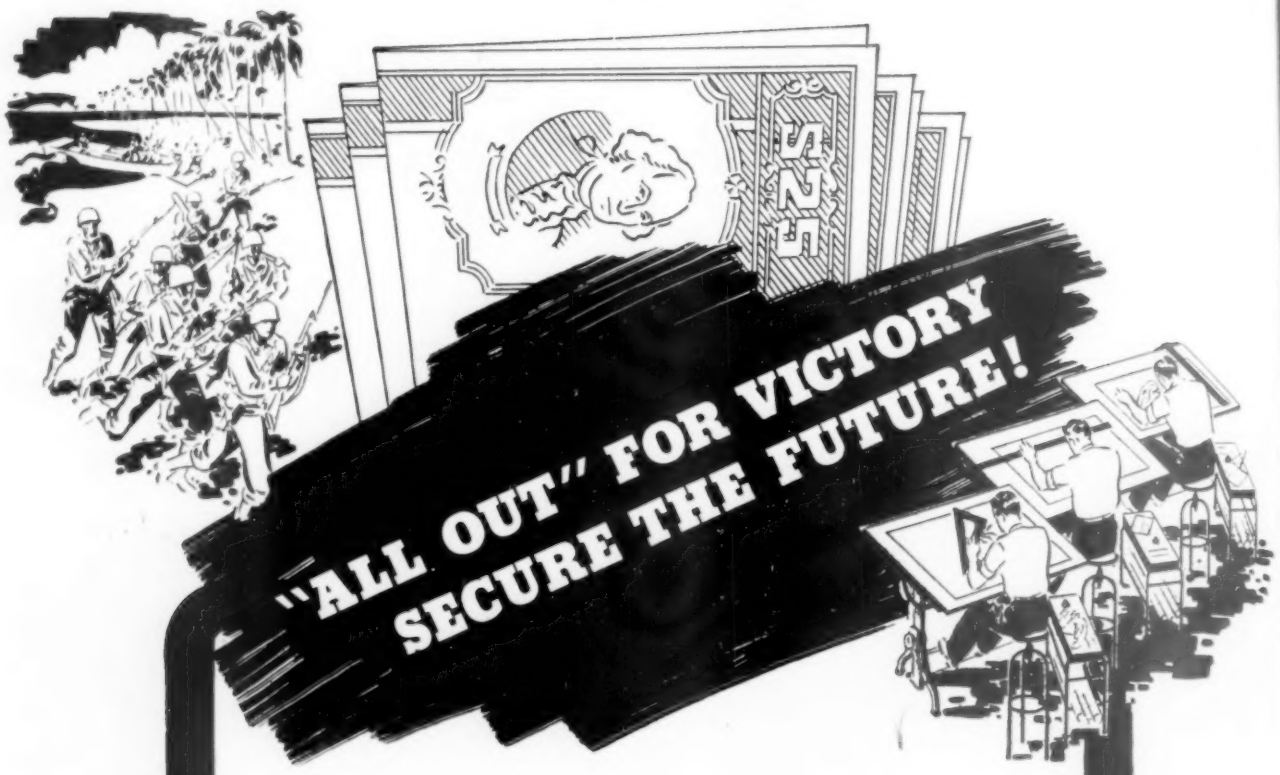
Even more important than the machine tools your company uses is the machine tool engineering that goes with the use of those tools!

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

Profit-producing Machine Tools

Just like buying bonds—



Everybody i uying bonds for all-out victory. They do it in belief that bonds will buy more weapons, be designed, better built, and that some day the an turn in the bonds for cash to buy better m andise than ever before.

You are not ppointing them about the better weapons. Do disappoint them about the b r merchandise. Vulcan can you even now to design the better tools fo heaper mass production. Vulcan is definitely erienced and definitely skilled in that sort o ing as your investigation of its reputation a performance will happily reveal. Ask for th ochure illustrated. It will better acquaint y with Vulcan's experience, facilities and service

The VULCAN TOOL Company

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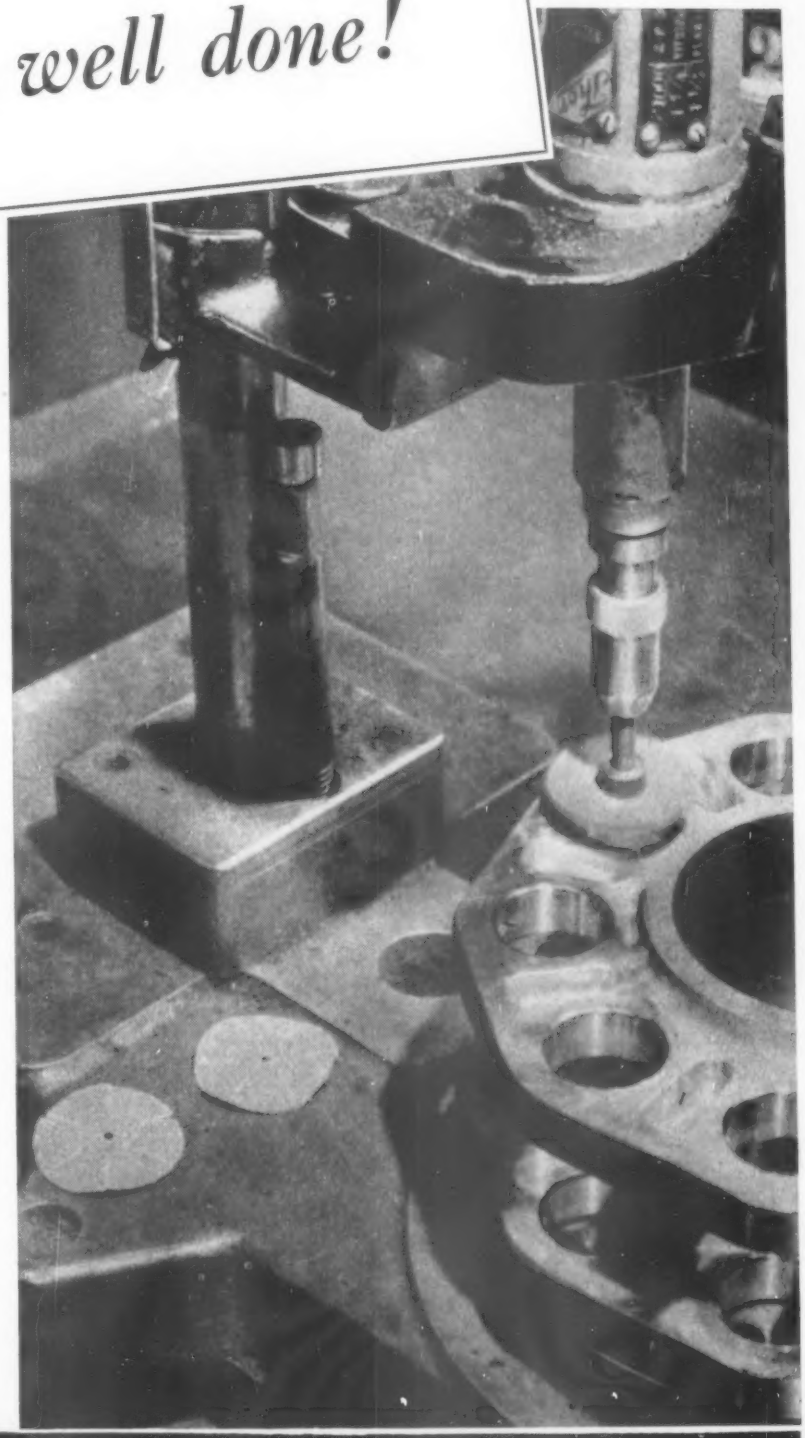
ENGINEERING,
DESIGNING,
BUILDING,
GAUGES,
TOOLS,
DIES, JIGS,
SPECIAL
MACHINERY

Right at the edge of a job *well done!*



Use of Slotted Abrasive Cloth Discs by Carborundum has resulted in amazing simplification of deburring and polishing operations on holes from 3/8" to 5 1/2" in diameter. Discs proportionately larger than the holes they are designed to deburr and polish are attached to power driven spindles. Pressed against the work, the discs cone, and give a true radius to the edges of the holes without touching the sides. It's a fine example of choosing the right abrasive product for the job.

The use of abrasives in deburring, polishing, and in tool room work has seen an enormous advance in the last year or so. That's why we urge you to call on Carborundum Abrasive Engineering Service for help with your abrasive problems. Just call our nearest sales office. The Carborundum Company, Niagara Falls, N. Y.

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TRADE-MARK
ABRASIVE PRODUCTS

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

Coated Abrasives by CARBORUNDUM
TRADE-MARK

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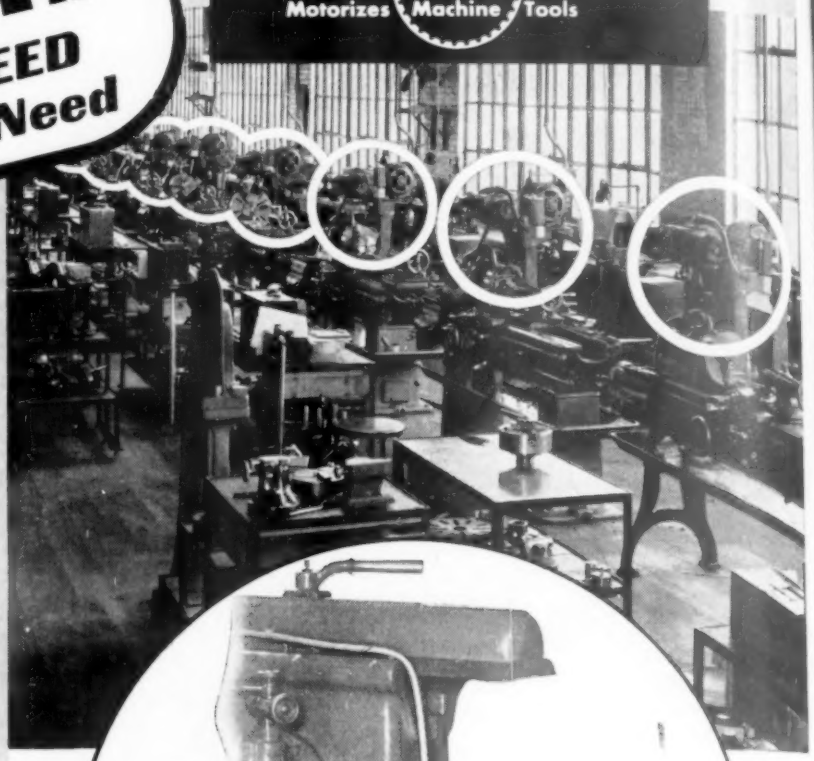
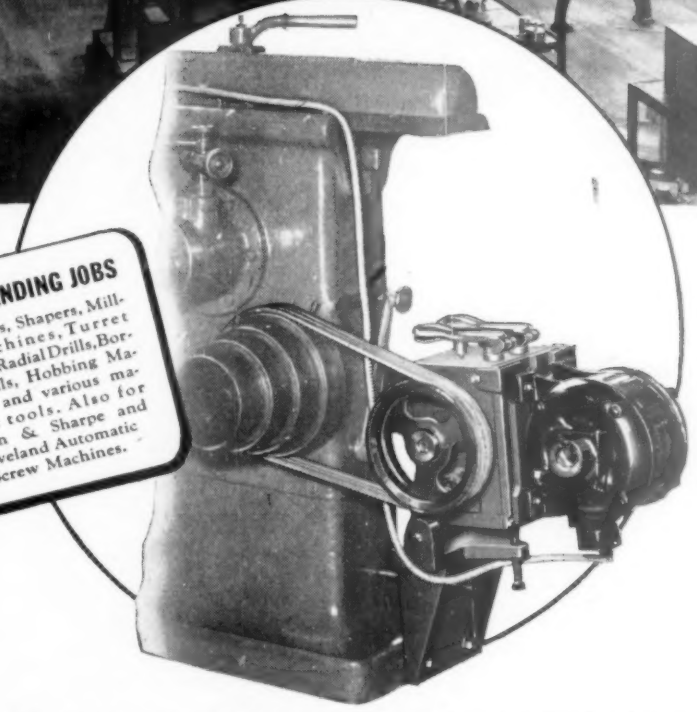
PACE SETTER
Where SPEED Is a Vital Need

TURNER
UNI-DRIVE
Motorizes Machine Tools





OUTSTANDING JOBS
on Lathes, Shapers, Milling Machines, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools. Also for Brown & Sharpe and Cleveland Automatic Screw Machines.

–Increasing Production
–Lowering Costs In Hundreds of Plants Like These:

American Brake Shoe & F. Co.
Kellogg Division
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Electric Auto-Lite Co.
Frankfort Arsenal
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Kohler Corporation
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The New York Air Brake Co.
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● It is actually keeping users ahead of schedules by increasing production up to 25% to 300% and slashing costs. No belts to shift—drives to large step of cone at all speeds. Eliminates overhead line and countershafts. All advantages of geared head with belt drive smoothness. See your dealer or write for details.

THE TURNER UNI-DRIVE COMPANY
(Sales Division: Turner Machinery Co.)
3416 Terrace Street **Kansas City, Mo.**

NOW AT WORK FOR VICTORY ★★★

PRODUCING MACHINE TOOL DRIVES • AIRCRAFT FITTINGS

REGRINDING by new tool craftsmen!

FOR BEST SERVICE SEND YOUR WORN CUTTERS TO THE NEAREST SEVERANCE PLANT

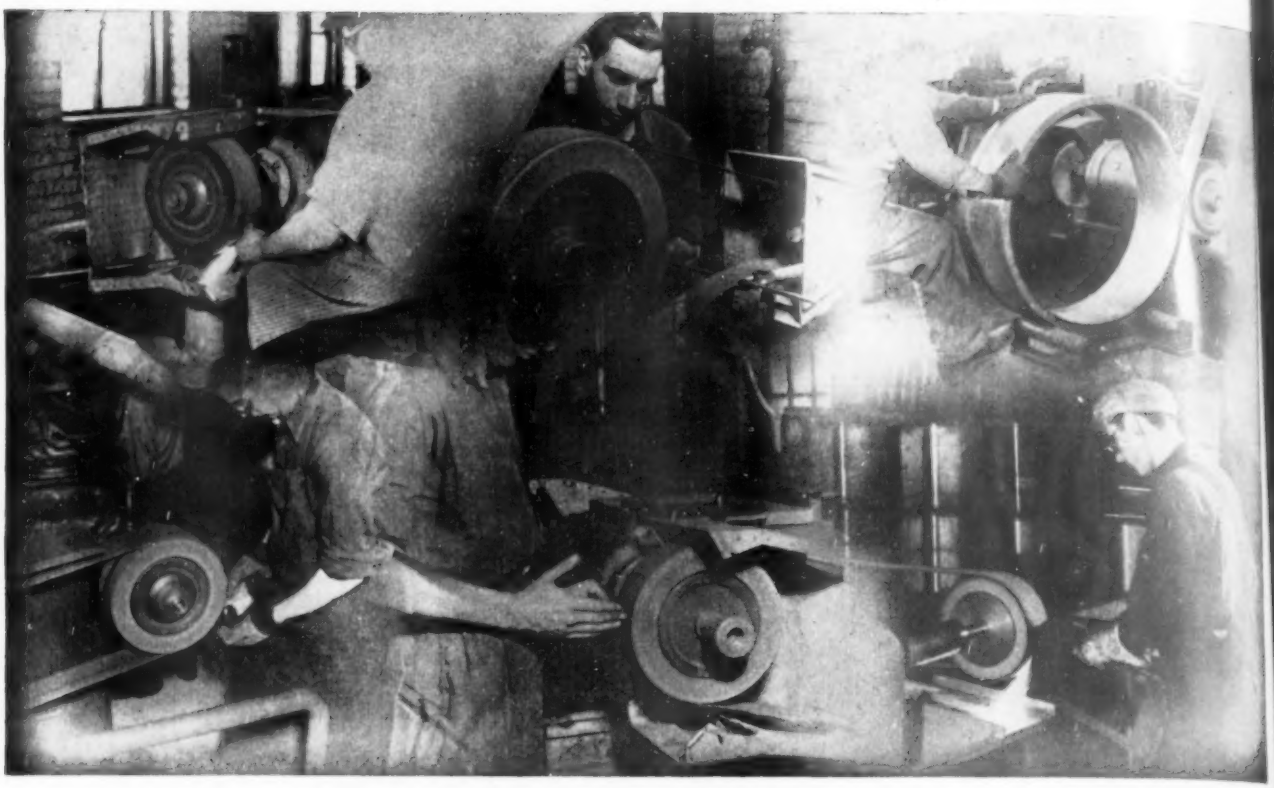
In the six modern, completely equipped Severance plants in the United States, the renewing of worn, dulled rotary cutters has become as much of the daily business as the manufacture of new tools.

Actually, the regrinding of your worn tools requires the same experience and the same precise skill as used by Severance craftsmen in the manufacture of new Severance tools. Each flute is given the correct pitch and depth so the finished tool will not chatter. Each edge is carefully ground so the renewed tool will take the same deep, sharp bites as a new tool. And after being accurately reground, your tools are further improved by the exclusive "Severite" heat treat process that gives additional hardness to the teeth and increases their cutting life—between regrinds—from three to five times.

Check up on the worn and dulled tools in your plant now. For best service, send them to the Severance plant nearest you for a factory regrinding job.

Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING • SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICH. • PLANTS IN LONG ISLAND CITY, 1, N. Y.; DETROIT, 2, MICH.; FORT WAYNE, IND.; CHICAGO, 6, AND LOS ANGELES, 21. IN CANADA: 60 FRONT ST., W., TORONTO, ONT.



These Idlers Increase Production

There are idlers and idlers. Some are no good to themselves or anyone else. But, when the simple change over of a polishing lathe to use of abrasive cloth belts by installing an Idler Backstand increases production as much as four times—that's worth looking into.

At the wheel: scientifically controlled abrasive cloth cuts faster, cooler, and more uniformly than a set-up wheel; dissipates heat through a constantly changing cutting surface; reduces your loss of polishing grain; makes changes of the fifteen available grit numbers a matter of only a few seconds—slip one belt off, another on.

Between pulleys: you have the facilities of a flexible belt for sanding and polishing tubes or rounds, or a platen may be set up for flat grinding. With factory-made Metalite Cloth Belts you have assured greater cutting speed plus uniformly smooth cutting action resulting from our even-running Uniflow Belt Joint.

Our Field Engineers are thoroughly equipped to explain the distinctive features of various Idler Backstands now on the market, so easily adaptable to this faster, better, modern method of finishing—the use of technically controlled abrasive cloth.

Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New York, Philadelphia, St. Louis, San Francisco, Tacoma.

QUALITY ABRASIVES

BEHR-MANNING • TROY, N. Y.

(DIVISION OF NORTON COMPANY)

Reliable Coated Abrasives Since 1872

How PILOT GAGES Speed Up Work

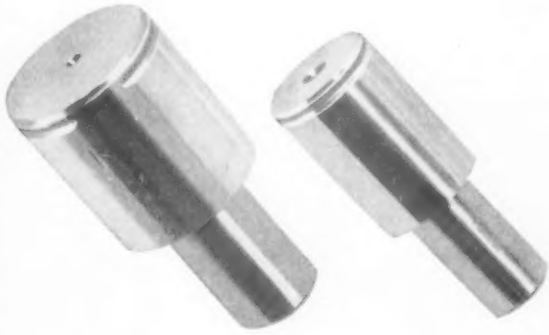
Time saved in gage applications means time and money saved in production.

Now take another look at the pictures. See how the PM Pilot plug gage is inserted from the side, at an angle. Then straighten it up to the perpendicular and it slides smoothly into the hole, even when there is only a slight difference in size between gage and hole.

There's no forcing of the gage, no jamming, no spoiled work, no damaged gages. Work goes smoother—gages last longer and hold their accuracy.

You can prove this in your own shop. Try just one pilot gage, if you are not already using them. That little groove around the nose makes all the difference in the world—in both the quality of your work and the economy of getting it done with speed.

On your next order for plug gages, specify the Pilot type—it will pay you.



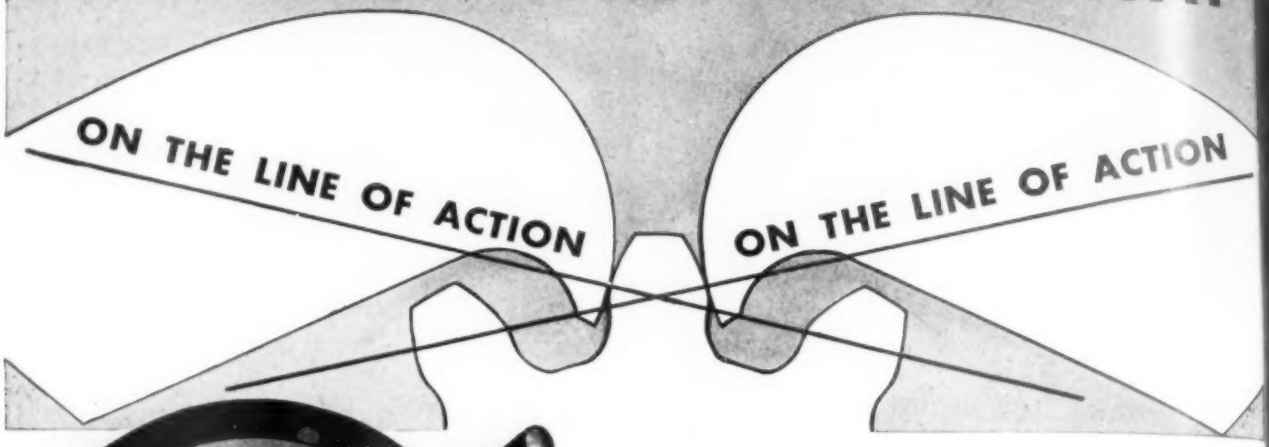
ARMY-NAVY "E"

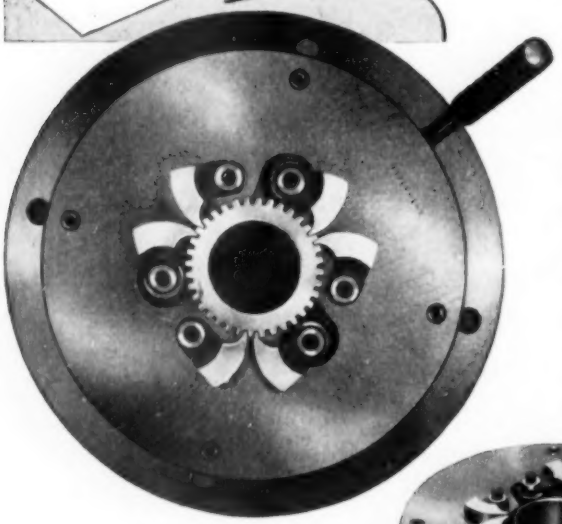
The PIPE MACHINERY COMPANY Cleveland, O.

To Hold Gears *with precision*

FOR BORING OR GRINDING

HAVE TEETH GRIPPED THIS WAY





Method eliminates distortion. Gripping action distributed around circumference rather than through diameter. Principle used only in

MATCH-IT GEAR CHUCKS

For grinding the hole, the hub face, or for boring most delicately constructed gears within your tolerances in relation to pitch diameter. Distance from root diameter to the hole or counterbore of any gear never presents a problem, as pressure is always against the sides of teeth, never toward the center along diameter to cause distortion.

MATCH-IT GEAR CHUCKS are made for internal and external gears, spur and helical gears, and countershaft type gears.

All your gears can have perfect, round holes. If your production gives you too many scrapped gears, perhaps your chucking can be improved. Our engineers can help you deliver a higher percentage of perfect gears.

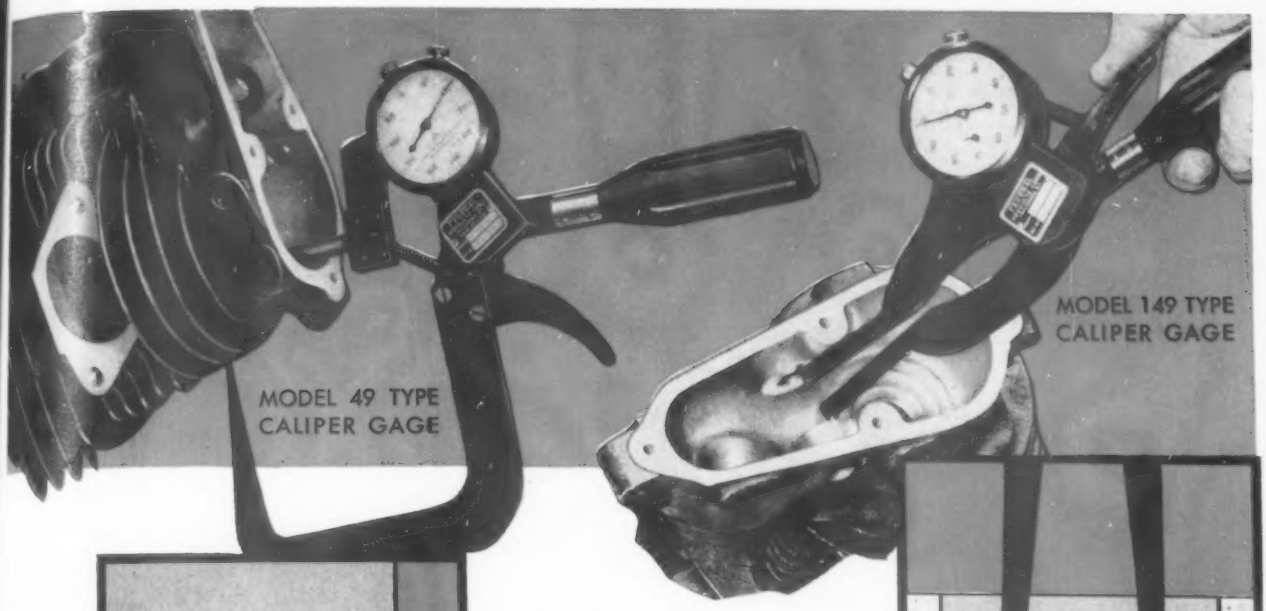
We believe no other chuck will produce as accurate results.

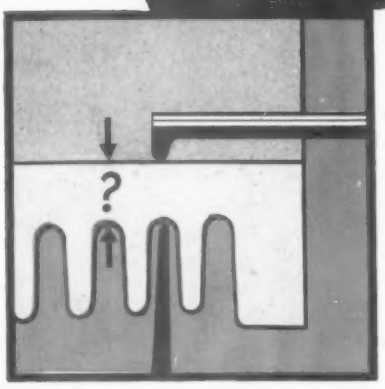
BUY WAR BONDS

LeMaire TOOL & MFG. CO.

2663 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

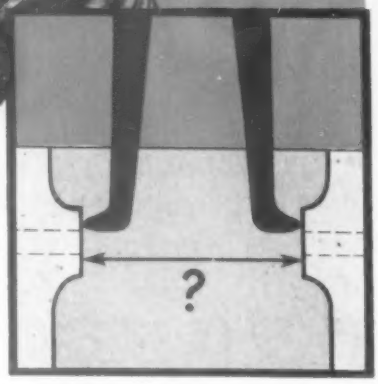
ENGINEERS AND BUILDERS OF PRODUCTION MACHINES





This Model 149 *Inside* Caliper Gage shows you *quickly* and *clearly* if the bosses on this casting are o.k.

The jaws of this Model 49P *Outside* Caliper Gage enter the hole and the recess between the fins of a casting to inspect the wall thickness.



The Easiest Way to Inspect OUTSIDE *and* INSIDE *DIMENSIONS* - - - - -

Dimensions do not have to be limited to fine tolerances in order to get a lot of use from these gages. Their greatest value is their convenience — their quick, easy and direct way of getting into odd positions and telling you whether a dimension is right or wrong, and *how much* wrong. The jaws can be made in every conceivable shape to get practically into any position.

The Model 49 *Outside* Calipers and the Model 149 *Inside* Calipers are equipped with Dial Indicators graduated in .01" or 1/64". They can be furnished for comparing dimensions or for direct measurements. Though not high precision instruments, they are exceptionally popular calipers. Their use has saved many times their cost, time and again. It will pay you to use them rather than take a chance on many a job. Use them on patterns, cores, castings, forgings, tubing, shells, bottles, plastics, formed shapes; in fact, any irregular shaped workpiece. Ask us about a gage with jaws designed to fit your work.

BRANCH OFFICES

CHICAGO • CLEVELAND • DETROIT
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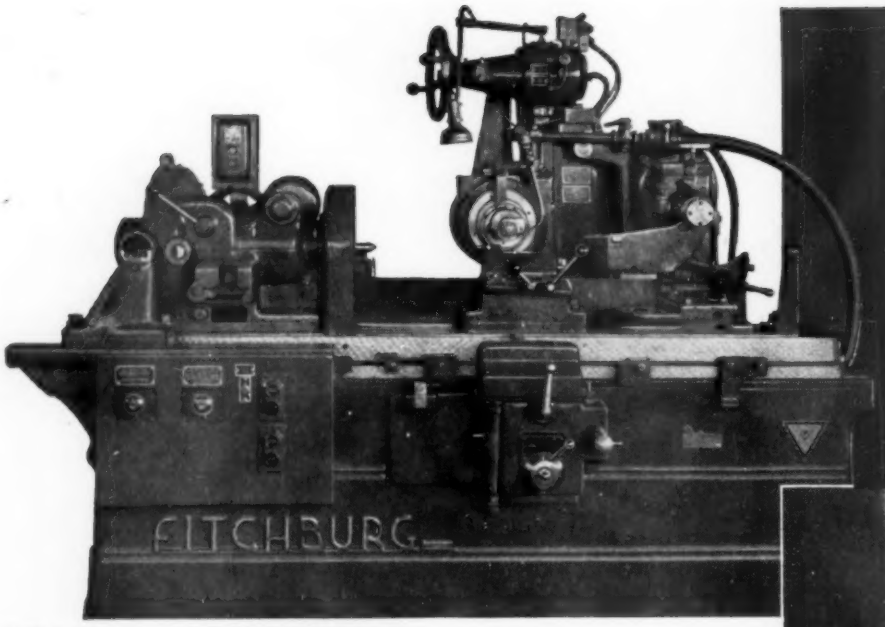
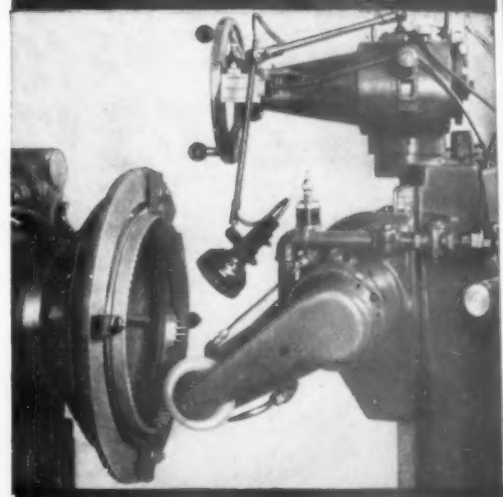
1144 EDDY STREET, PROVIDENCE 1, R. I.

★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS





SPLINE GRINDING?
SPLINE SHAPING?
INTERNAL GEAR GRINDING?
EXTERNAL GEAR GRINDING?

.... Do all four on the Fitchburg Gear Grinder

A single Fitchburg Gear Grinder, with special attachments will

GRIND internal or external, helical or spur gears — straight, taper and helical splines, and will also

SHAPE straight, taper and helical splines.

A leading automobile manufacturing plant now engaged in making airplane engines, is using Fitchburg Gear Grinders with Special Wheelheads in the important operation of grinding internal gears. They give highest praise to its accuracy, fine finish and high production at low cost.

You can get the same results on a variety of work—on this one machine—why not let Fitchburg engineers show you how. Write today.

FITCHBURG GRINDING MACHINE CORP.

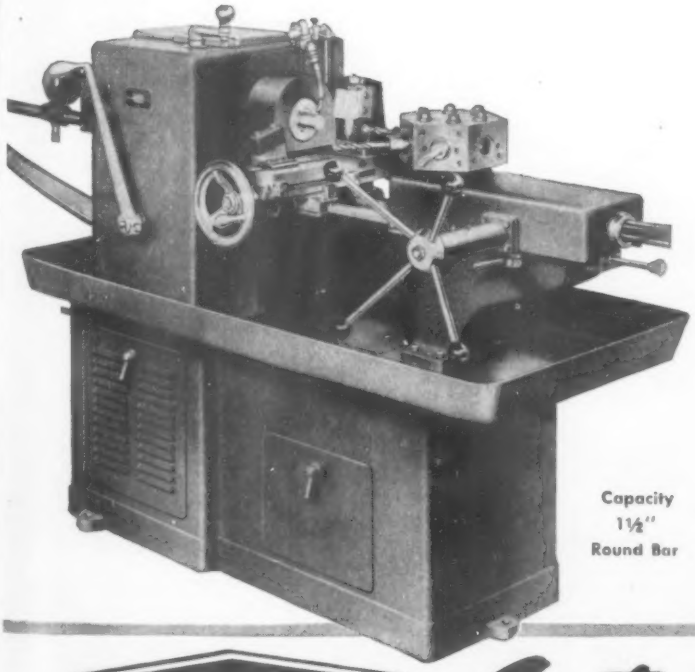
FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

Note these 7 Advantages

(Reported by an Owner of Oster "Rapiduction" Lathes)

1. "Replaces expensive machines"
2. "Replaces experienced workers"
3. "Sturdily built"
4. "Wide application"
5. "Maintains accuracy"
6. "Up-keep very light"
7. "Keeps costs under control"



Capacity
1½"
Round Bar

Those 7 advantages summarize a more detailed statement made by a manufacturer of bomb parts and 37 mm. shells. His comments regarding the performance of Oster No. 601 "Rapiduction" Lathes check with the experiences of hundreds of other owners of these modern SIMPLIFIED machines.

Low initial cost, low operating cost, low maintenance cost combine to make Oster "Rapiductions" the most practical machines for a wide diversity of bar and chucking operations.

The Oster No. 601 "Rapiduction" can be furnished with the automatically indexed, six-station turret or with plain saddle and single tool post. Either the WORM DRIVE or the DIRECT DRIVE can be furnished depending upon spindle speeds required.

An Oster Distributor near you will supply you with illustrated Catalog No. 27-B. If you don't know his location, write:

THE OSTER MANUFACTURING CO.
2063 East 61st Street • Cleveland 3, Ohio, U.S.A.

OSTER *Cuts Your Costs!*

"A PERFECT RECORD!" say Pratt & Whitney of Davis Boring Tools . . .

PRATT & WHITNEY AIRCRAFT
CORPORATION OF MISSOURI
KANSAS CITY 10, MISSOURI
January 11, 1944

Davis Boring Tool Company
6200 Maple Street
St. Louis, Missouri

SUBJECT: Information on Major Rejection Percentages of Special Tooling.

Gentlemen:

In an effort to keep our special tool vendors informed, we have compiled a percentage record on major rejections. This refers to those tools returned to the vendor for rework or replacement because they have failed to meet blueprint specifications.

In fairness to you and ourselves, consideration should be given this rejection percentage each month. This will enable us to work closer together in order to make any adjustments necessary to hold rejections to a minimum.

Rejections to December - - - 0% Value $7438.08
Rejections for December- - - 0% Value $8562.05

We believe that you are to be complimented on this record. You must realize what it means to us to feel assured that the tools we order from the vendor will be made to our exact blueprint specifications.

You may be sure that this good record will not be neglected from our standpoint. We shall keep the proper departments informed as to your company's ability to produce tooling to blueprint specifications. Our greatest desire is to be of assistance to you in any way that will enable you to maintain such a record. Please do not hesitate to contact us if any problems should arise.

Very truly yours,

PRATT & WHITNEY AIRCRAFT
CORPORATION OF MISSOURI

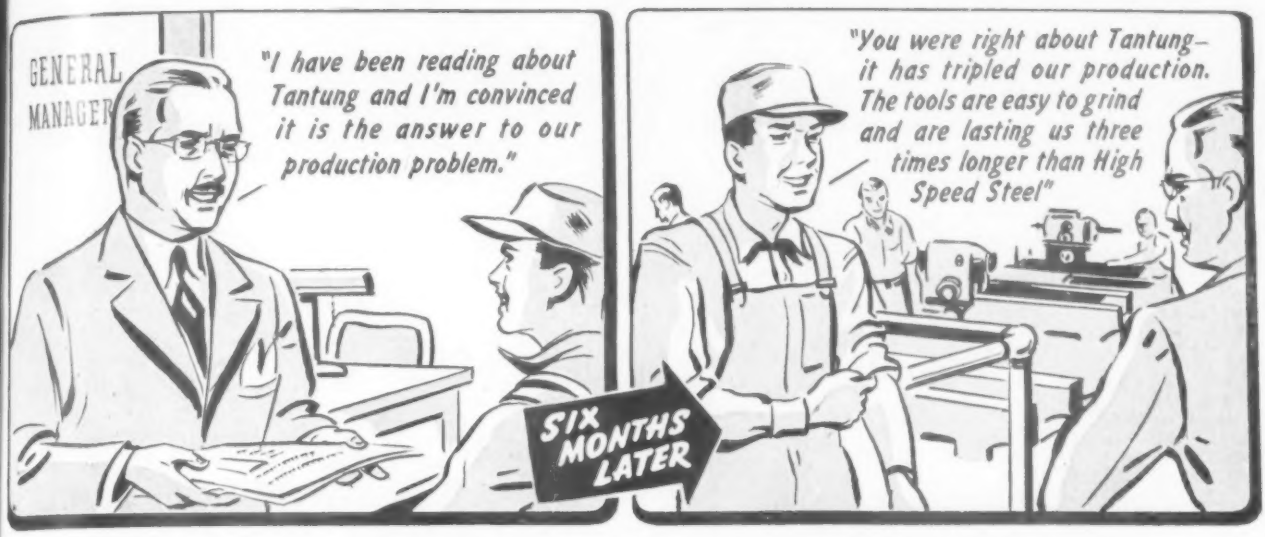
John W. Harvey

John W. Harvey
Supv. Vendor Contact Dept.

DAVIS
BORING TOOLS

DAVIS BORING TOOL DIV.
LARKIN PACKER CO., INC.
SAINT LOUIS 14, U. S. A.

Only TANTUNG Could Have Done This!


GENERAL MANAGER
"I have been reading about Tantung and I'm convinced it is the answer to our production problem."
SIX MONTHS LATER
"You were right about Tantung—it has tripled our production. The tools are easy to grind and are lasting us three times longer than High Speed Steel"

This "Miracle Tool Metal" is establishing amazing records. It operates at highest efficiency between 90 and 190 surface feet per minute and "Fills the Gap" between conventional High Speed Steel and Cemented Carbides.

What TANTUNG is Doing!

Read a few of the many voluntary endorsements sent us by enthusiastic users of TANTUNG:

"We turn out so much more work with Tantung and cannot afford to use high speed steel."
—By an aircraft parts manufacturer

"We find that Tantung Tool Bits not only hold an edge about three times longer than the best high speed steel, but we can put our spindle up to practically the same speed as carbides." *—By a die casting manufacturer*

"Tantung Tool Bits and Tips are giving us excellent service and we are very much pleased with the increased production we are getting from their use."
—By a cast iron pipe manufacturer

"We have found Tantung Tool Bits satisfactory in every way and in a good many cases, we have more than tripled our production over the regular high speed steel tool bits." *—By a pump manufacturer*

"To date, we have purchased approximately 15,000 Tantung Tools; and as production increases, our purchases of these tools will probably increase accordingly."
—By an aircraft engine manufacturer

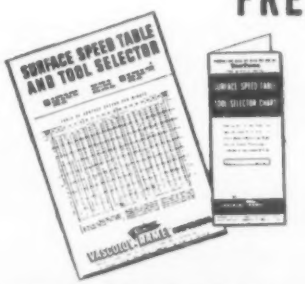
"Since using Tantung on stainless steel and other tough alloy jobs, we would not think of changing Tantung Tools for any other tool on the market." *—By a key manufacturer*

TANTUNG is a non-ferrous cast alloy that cuts rolled, forged or cast steel, annealed or heat treated, and any material that can be machined. Operates at greater speeds, heavier cuts, heavier feeds, produces more pieces per grind and insures better finish than high-speed steel tools!

More than a million Tantung tools have been used for practically all machining operations. Tantung has an exceptionally high transverse rupture strength—is tough and shock-resistant. It is self-lubricating and due to its keen, durable cutting edge, "cratering" or "chip wear" is reduced to a minimum.

Standard Tantung tools fit all standard tool posts and holders—are easy to grind, no diamond wheels required. Wheels for grinding high speed steel are sufficient. Detailed information regarding the use of Tantung is fully covered, graphed and illustrated, in the new Tantung Catalog. Write for a copy of the Tantung Catalog today.

FREE CHARTS GUIDE OPERATORS' TOOL SELECTION



Charts show at a glance, Table of Speeds, Feeds and Proper Tool Selection . . . show when to use High-Speed Steel, Tantung or Carbide tools for best results. Advise us how many "Wall Charts" and how many "Pocket Charts" your plant will require. There is no obligation.

4445

VASCOLOY Ramet RAMET CORPORATION

NORTH CHICAGO, ILLINOIS • SALES AND SERVICE IN PRINCIPAL CITIES

...Help Keep Yours in Step by Using...

SAFETY GRINDING WHEELS

Any way you look at it, production lines . . . yes, your production lines . . . are just as vital to victory as are the front lines "over there"! And to keep your lines in step, the best equipment available is paramount.

That's why so many plants are turning to SAFETY Grinding Wheels today. SAFETY Wheels are especially adapted for grinding aluminum, cast iron, steel castings and welds. They grind fast, run cool and assure an unusually smooth finish. And because of their ruggedness and exceptionally long life, production lines keep in step with fewer interruptions for replacements.

Try SAFETY Grinding Wheels on your toughest jobs. We'll gladly send you wheels for any test you want to give them. Write on your letterhead for illustrated folder and sample desired.

You'll get expert grinding wheel advice and quick service on deliveries by getting in touch with our factory or the SAFETY Sales Office nearest you. See addresses below.

THE SAFETY GRINDING WHEEL & MACHINE CO.

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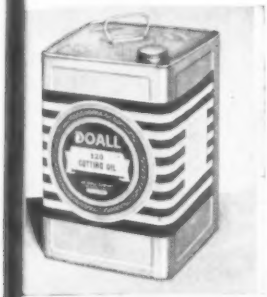
DoALL AIDS TO BETTER MACHINING

DoALL BAND SAWS

Precision blades with extra hardened teeth, engineered for straight or contour sawing of any metal or material.



DoALL CUTTING OILS

DoALL 120 and 240 Cutting Oils prolong saw and tool life, improve finish and permit increased cutting speed.

DoALL POLISHING BANDS

Silicon carbide and aluminum oxide bands 1" wide. Coarse, medium or fine. Fit DoALL Contour Machines or custom made to any length.

DoALL BAND FILES

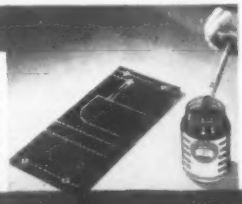
There's a proper style and width to do every kind of job from the very toughest material to the most delicate.

DoALL SAW EEZ

An excellent saw lubricant to minimize scoring of blade and lengthen its life. Used on band, hack and circular saws, lathe centers, etc.

DoALL STEEL INK

For precise layout work on dies, templates and machine parts. Deep blue violet color, glareless. Dries in 1½ min. Used by leading aircraft and tool makers.



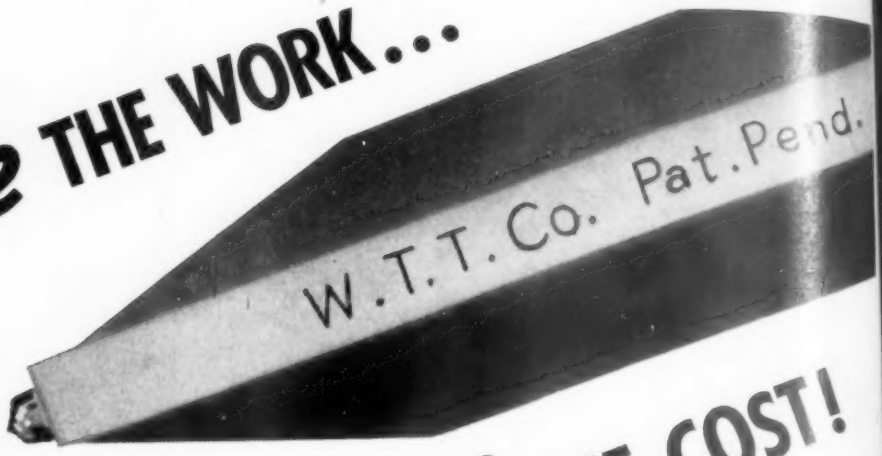
FREE LABORATORY SERVICE

If you have some tough material to saw, file or finish, send a test piece to our Research experts who are constantly at work on better machining methods for industry. You will receive a written report of recommended procedure and short cuts.

DoALL

Write for Literature, mentioning products in which you are interested.
THE DoALL COMPANY, 1205 Thacker St., Des Plaines, Ill.

Double THE WORK...



AT Half THE COST!

A Typical Example of TRU-THREAD DIAMOND TOOL ECONOMY

TRU-THREAD DIAMOND TOOLS are available for forming the wheels that grind ACME, BUTTRESS, U.S.S., WHITWORTH and any special form, groove or standard thread.

Look at the cost records of production jobs wherever Tru-Thread Diamond Dressing Tools are at work and you'll see *ECONOMY* you never before thought possible. Here's an example—from the shop of a large nationally known manufacturer:

> "Although our Tru-Thread tools cost only one-half what we have been paying for previous tools on this job, the Tru-Thread tools have thus far run more than twice the average number of pieces we ordinarily got from our previous tools, and they are still in use with no evidence of an immediate breakdown."

That letter is typical of many in the files of Wheel Trueing Tool Company—letters that speak of economy in terms of more work, faster work, cleaner cuts, longer holding forms, fewer required dressings and less down time.

TRU-THREAD Diamond Tool economy is the result of over a third of a century experience in designing, developing and manufacturing diamond tools of fine quality. *Write, wire or phone for further information today.*

WHEEL TRUEING TOOL COMPANY

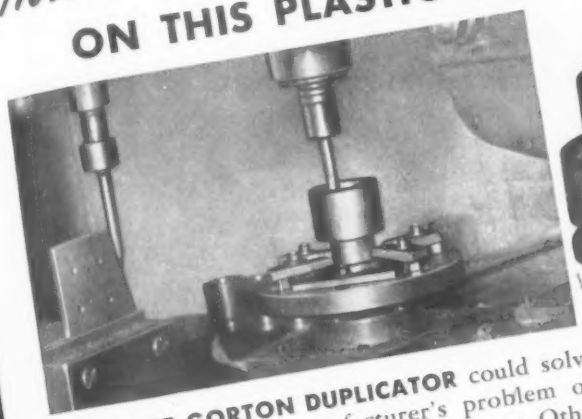
3200 W. Davison Avenue
Detroit 6, • Michigan

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING

How Tracer-Control SAVED 180 HOURS ON THIS PLASTIC MOLD WAR JOB



(Above) The taper, which could not successfully be generated by any other production method. Finished molded cone shown ¼ size.

ONLY THE GORTON DUPLICATOR could solve this Massachusetts manufacturer's problem on the production of molds for tapered cones. Other production methods caused an unevenness of the cut which could not be polished out.

The Gorton Duplicator was equipped with a power-driven rotary table. A simple template, held in a vise, was used as a master. TRACER CONTROL—the tracer moving along this template—guided the special cutter having a taper identical to that of the cone.

The floor-to-floor time for roughing by previous methods was 11 hours. The Gorton Duplicator cut this time to 2 hours—a saving of 180 hours on the roughing of 20 molds—and produced an extremely fine finish. Both roughing and finishing operations were done on the Gorton Duplicator.

PRODUCTION DATA

Material—Tool Steel.
Operation—Duplicating Molds.
Feed—Manual.
Speed—Roughing 750 r.p.m.
Finishing 3600 r.p.m.
Time, Floor-to-Floor—Roughing 2 hours—Finishing 1 hour.

Use Gorton Free Engineering Service

Gorton Engineers invite you to submit any problem to be solved. For more than 50 years, Gorton Engineers have constantly added to a wealth of machining information in our performance record files. These records often contain the solution to a problem similar to yours. Submit prints or specifications through your nearest Gorton dealer, or direct to the Gorton factory at Racine, Wisconsin. There is no obligation.

The *Right* Size The *Right* Type of Machine for Every Job . . .

From 2 oz. to 2 ton DIE BLOCKS

Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON ARMY NAVY

GORTON *Precision* MACHINES

CUTTER GRINDERS
ETCHING MACHINES
2 & 3 Dimensional PANTOGRAPHS
Vertical & Universal Head Super-Speed MILLERS
Manual & Electric Control DUPLICATORS

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George Gorton Machine Co.,
1322 Racine St., Racine, Wis.

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- ☐ Die and Mold Duplicators

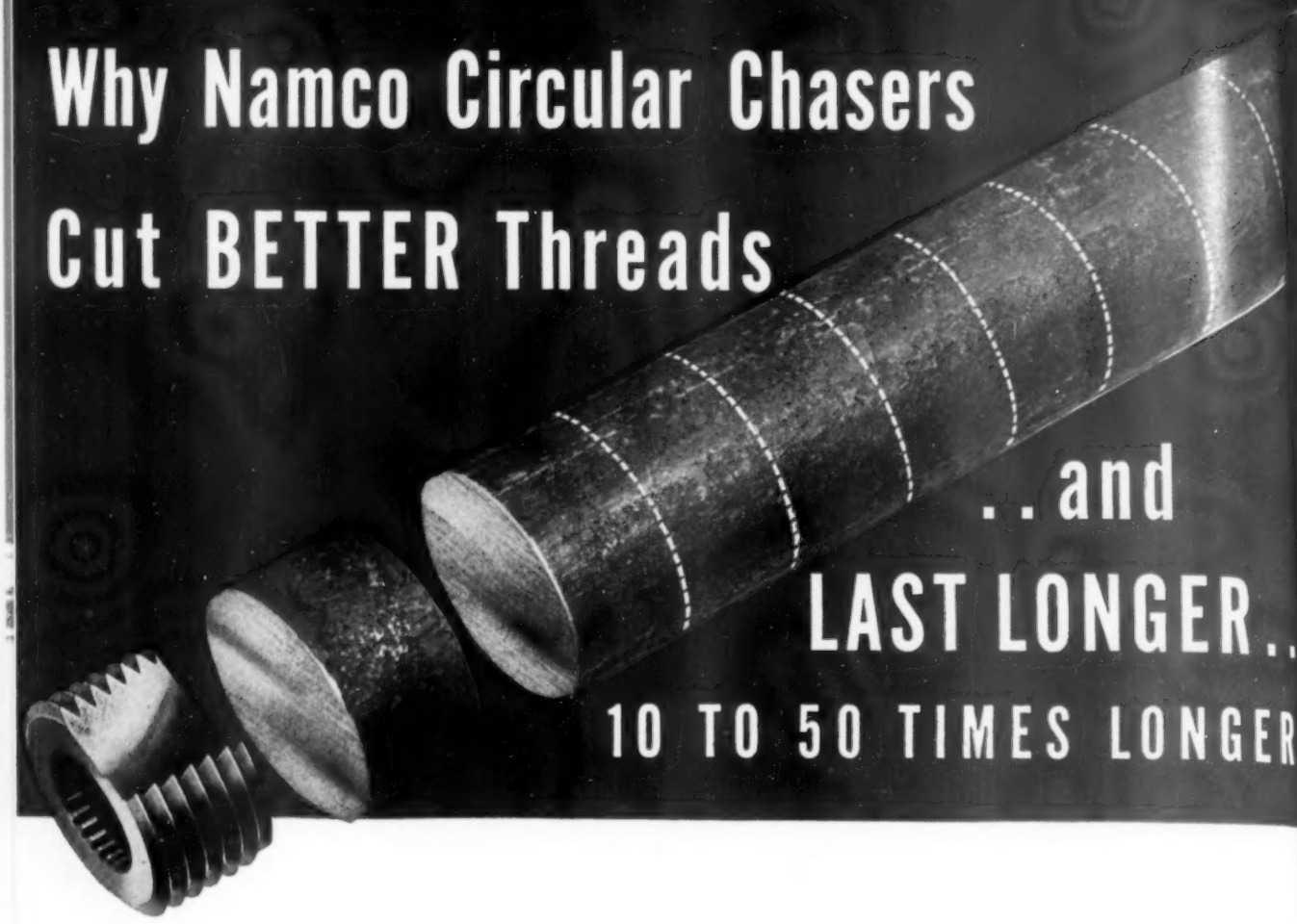
Name ..... Title .....

Company .....

Address .....

City ..... State .....

Why Namco Circular Chasers Cut BETTER Threads



..and LAST LONGER.. 10 TO 50 TIMES LONGER

High-speed tool steel bars have their densest, toughest and purest steel close to the "skin" —around their outside diameter. That's a metallurgical fact.

So, in making Namco Circular Thread Chasers, we first cut a slice from the bar, trim off the outer "skin", machine, harden and grind the chaser—and it's ready to go.

The "business end" of the chaser—the cutting edge—is *always* located in the toughest, wear-resisting part of the steel, for the life of the chaser.

This naturally means close tolerances and maintained precision, even on high-speed production runs.

No matter how many times the chaser is reground—up to 270° of its circumference—the cutting edge is always in the best part of the steel.

Experience has proved that Namco Circular Thread Chasers last 10 to 50 times longer. They are responsible for big cost savings in production shops that have the highest standards of accuracy.

Namco Circular Chasers are mounted on blocks set in Namco Dieheads, revolving or stationary. Replacing chasers is a 2-minute job—with no "trying for size", no spoiled work, and no variation from steady uniform production.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

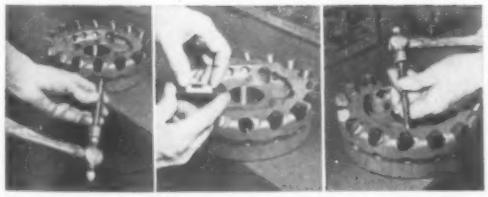
ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

there lies the success

OF EVERY LOVEJOY TOOL

No inserted-tooth type tool is better than its locking device. The POSITIVE-LOCKING feature used on all Lovejoy tools has *proved* itself correct over the past 27 years. This device has many advantages—(1) Round holes do not weaken the tough, forged steel housings, (2) serrations are on the front of the blade, not on the back or locating side, (3) short blades are held as rigidly as new blades, (4) over 50% of HSS blades can be used before they must be discarded, (5) blades can be removed or replaced in a few seconds, (6) all blades are interchangeable in a single cutter, and one size of blade often covers a wide range of cutter sizes, (7) all standard blades are carried in stock for immediate shipment, (8) carbide tipped blades can be used to full advantage.

Complete information on Lovejoy tools will be sent on request.



Tap out the wedge— Move the shoe down— Tap in the wedge—Grind

IT'S AS SIMPLE AS THAT!

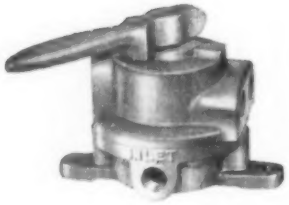
Positive-locking Tools

LOVEJOY TOOL COMPANY, Inc., Springfield, Vermont

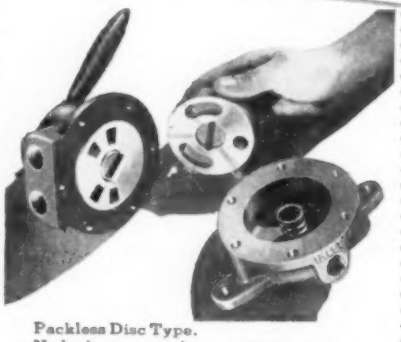
MILLING CUTTERS | SINGLE POINT TOOLS | BORING HEADS | BORING BARS | SPOT FACING TOOLS | TURRET TOOL POSTS | COUNTERBORES

CHOOSE THE *Air Valves* YOU NEED...

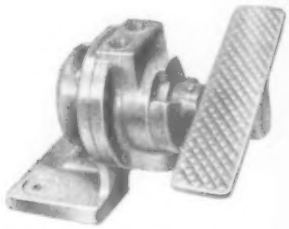
THEY'RE ALL HERE



Hand Operated Valves; 15 sizes and types.



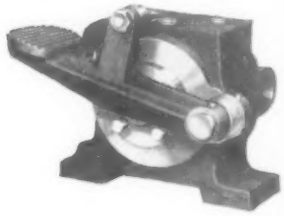
Packless Disc Type.
No leakage or packing maintenance.



Foot Operated Treadle Valve; 9 sizes and types.

Spring Return Foot or Hand Operated Valves; 6 sizes and types.

Manifold Type, bottom connections. Used individually or with made-to-order manifolds. 9 sizes and types.



Rotary Type—ratchet action for advance and return of cylinder. 3 sizes.

Speed Control Valve. To control speed of cylinder. Free flow return.

Duplex Valve to control two cylinders in any sequence desired.

Pressure Regulating Valve—Piston Type, Sensitive Control, Large Volumetric Capacity.

Hannifin Air Control Valves give you a complete range of choice in hand or foot operated models, for control of any single or double acting cylinder. Any Hannifin Valve will give you positive, accurate control of air operated equipment, plus a simple, effective design that assures long service with minimum attention.

Write for Valve Bulletin No. 57.

HANNIFIN MANUFACTURING COMPANY
621-631 SOUTH KOLMAR AVENUE • CHICAGO 24, ILLINOIS

Hydraulic Presses • Cylinders • Riveters • Pneumatic Presses • Air Control Valves • Quenching Presses • Pneumatic Vises

HANNIFIN AIR CONTROL VALVES

PRODUCTION PERSPECTIVES

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

WAR PRODUCTION: The 2 per cent drop in January output indicates divergent trends expected in 1944....Total volume no longer is important. Watch for shifts of production-emphasis to meet month-by-month fighting front requirements....In January, WPB pushed landing craft as the number 1 program. Result: 20 per cent boost in output.

AIRCRAFT: Now sharing the production spotlight with landing craft, plane builders maintained unit output in January at 8,789, boosted airframe weight another 5 per cent....In February, daily output hit a new high - 350 planes every 24 hours. Airframe weight turned out jumped another 4 per cent. Significance: Average weight per plane has soared from 9,288 pounds in 1942, to 12,639 pounds per plane last month.

COST SAVINGS: Credit is due production men for sharp drops in war materiel costs....Contract prices are 20 per cent below 1942's, with estimated savings over 9 billion dollars. Additional savings of 4 billion, 700 million are expected before July.

MATERIALS: General easing does not foreshadow substantial allocations for civilian output. Overnight shifts in production-emphasis make accurate charting of war industry requirements difficult. Example: Currently tight steel plate, pipe and tubing despite overall improvement in steel several months ago...Increased steel for civilian goods is more remote than ever.

RECONVERSION: Much talk, little action. Army and Navy are still running the production front....Trade journals that predicted auto production by summer are banking on the new industry advisory committee of motor magnates scheduled to shake hands with WPB in Washington this month. Announced purpose of meeting: To "explore" reconversion problems....Trouble ahead: WPB's Nelson and the Senate's Truman disagree on who get the green light first, old-line manufacturers or new entries in mass production fields. Nelson gives the nod to old-timers, Truman to anybody who can get out of war production, find men, materials and markets.

MACHINE TOOLS: Continuing a 13-month slide downward from late 1942 peak levels, shipments dropped another 6 per cent in January....Builders are scheduled to do 200 million dollars non-machine tool war work this year ....More old-line concerns tell TOOL ENGINEER editors they will go after repair and rebuilding business....POST-WAR MARKET: Detroit looks better than ever. GM admits plant modernization will require "tens of thousands" of machines. Packard has earmarked 3 million, 500 thousand for machines. Nash will invest heavily. Ford is still mum.

FOR SALE: The anticipated war-glutted machine tool market is here. Excess idle machines - many unused - are piling up with 16,000 units listed by WPB's Redistribution Division in the Detroit area alone.

LAST-MINUTE NEWS REVIEW OF MASS MANUFACTURING

THESE MEN "TAILOR" TAPS

BEHIND the scenes ..... "Greenfield" screw thread engineers look over each order for "Greenfield" Taps.

They are "tap tailors" extraordinary!

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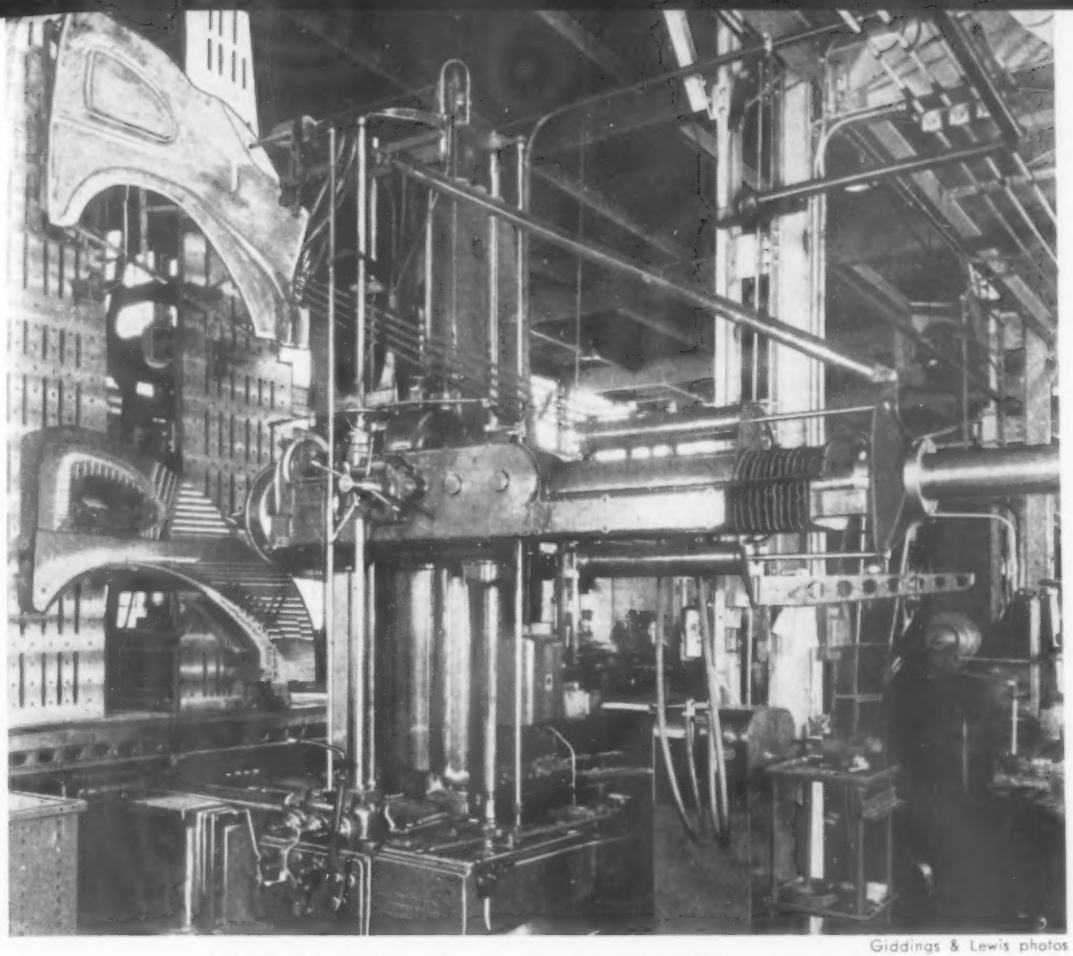


Giddings & Lewis photos

FIGURE 1. Use of a relatively simple duplicator attachment permits machining dies on the horizontal boring mill. This table-type machine is equipped with hydraulic cylinders to actuate spindle travel.

UNUSUAL JOBS ON THE HORIZONTAL BORING MILL

E. E. WAGNER
and
GEORGE R. HOLT

POSSIBLY no other machine tool is used more often for performing unusual jobs than the horizontal boring, milling and drilling machine. This is due primarily to two factors. First: The universal range of possible operations, together with the wide range of adjustments, feeds and speeds, enables an endless variety of work to be performed. Second: The machine itself is available in three basic standard models, each having design features which make it particularly adaptable to regular as well as unusual work.

The three basic machine models are the table, floor, and planer types.

The table type machine (Figures 1 and 2) is the most widely used of the models. It rests upon a saddle permitting adjustment to and from the headstock, as well as on a cross-traverse. When equipped with extended saddle and saddle supports, the table has nearly full support throughout its entire cross travel. The floor type machine (Figure 7) is provided with an adjustable column which can be fed and traversed upon a runway. These machines are provided with stationary floor plates upon which the workpiece is mounted. The planer type machine (Figure 3) also has an adjustable column, but differs from the floor type in that the column is adjustable to and from a conventional planer type table and bed unit, which in turn is attached to the column runway.

Several examples of how these machines have been adapted to unusual jobs are presented in the accompanying illustrations. The operations and work shown, however, represent only a few of the many applications to which these machines are suited.

The horizontal boring, drilling and milling machine derives its name from its ability to perform any one or all of these operations. In addition, turning and threading operations can be handled on the standard machine. All of the machining possibilities of the machine may be increased to handle many unusual jobs by the addition of a few standard accessories or attachments. Complete knowledge of the machine and its attachments, together with a liberal portion of imagination, are the only items necessary to handle an unusual job in the most economical manner.

The horizontal boring, drilling, and milling machine's wide adaptability may offer an economical and time-saving solution to your shop headaches. Several examples of smart tooling with this equipment are described here

A workpiece may be considered unusual for many reasons. It may require special handling or machining because of its size. If it is large and unwieldy, setup is a major problem. It is necessary then to accomplish as many operations in as few settings as possible. Another job may be smaller and physically easier to handle, but may require close tolerances of various machined surfaces in relation to one another.

UNFORTUNATELY, the product engineer cannot always make the easiest machining possibilities a prime consideration when designing a part. Because foundry conditions, assembly possibilities, and constructional rigidity are only a few of the items the designer must consider, it is impossible to establish hard and fast rules as to why certain parts should be designed in any one way. Each design is peculiar to its particular application, and the only standards that can be used are established ones involving machine elements such as bearing bores, keyways, threads, and similar factors.

Probably on no other type of equipment is a machine operator given more opportunity to display his ingenuity than on the horizontal boring mill. Because the unusual job is usually of singular or small lot quantity, its successful machining depends a great deal upon his ability. Unquestionably, the cost of special fixtures for holding the work cannot be justified on small lot production.

The ability of the operator to devise a successful clamping or workholding method with standard equipment eliminates the need for special fixtures. Likewise, his ingenuity to devise special tooling applications to the machine and its attachments will increase capacity for the job.

It is impossible to cover in detail all types of unusual jobs handled successfully on the horizontal boring mill. However, illustrations of a few outstanding cases where very difficult jobs were successfully completed explain in some detail the versatility of this type machine.

An interesting application of the horizontal boring mill is illustrated in Figure 2. This shows how a relatively simple duplicator attachment permits machining of automobile rear side panel dies to exact proportions. The table type machine is equipped with hydraulic cylinders which actuate the spindle in and out. The combination of the headstock feed or the table feed and the action of the hydraulically operated duplicator, enables duplication of a great variety of parts. This particular attachment is primarily used in body die shops.

THE DESIGN of the angle plate is noteworthy. It is in four sections, which permits ready adaptation to large or small work within the machine capacity. The upper two sections have only elongated slots to permit clamping of the template which is not subjected to cutting pressures. The lower two sections are

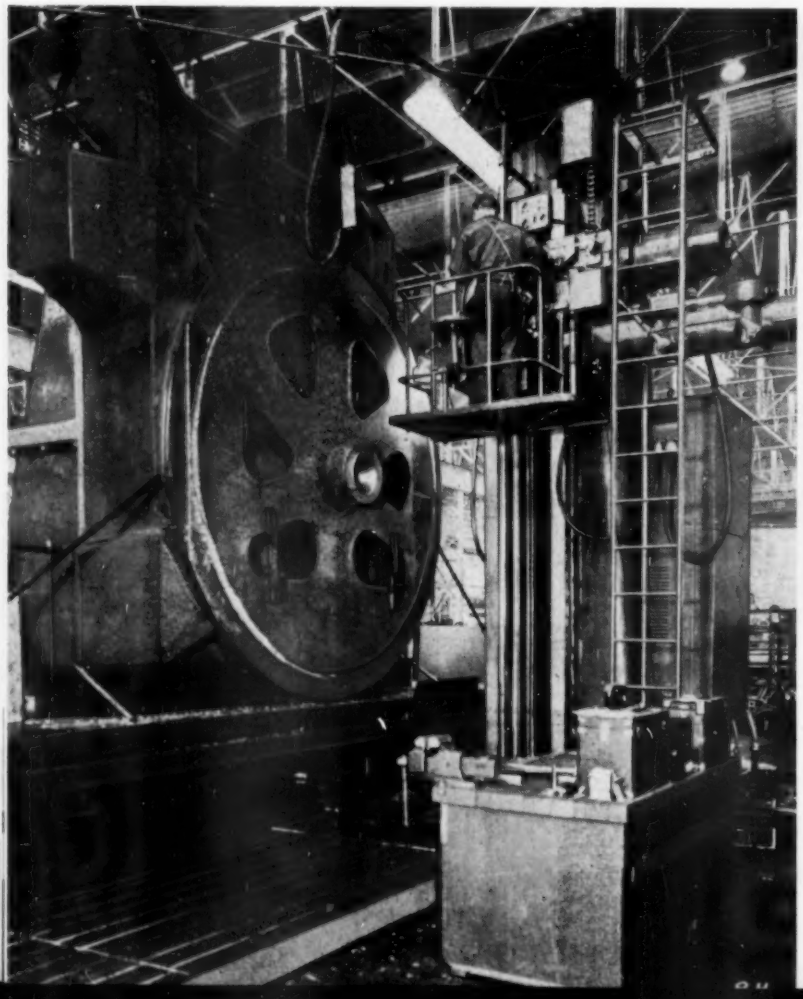


FIGURE 2.
Standard table-type machine handles heavy machine part in one setting. Rotary table permits indexing part for positive location of each job.

***Left:* FIGURE 3.**
A planer-type machine is used to bore the fulcrum stem of a big base plate. The bearing diameter is milled in the same setting.

equipped with a series of tapped holes and elongated slots to provide correct location of the die to the template, proper support, and clamping facilities.

Two types of tracer head followers are necessary. Diameter of the contour follower is controlled by the fillet joining the roof and rear deck sections. The follower for the profile or side sections is egg-shaped, with diameter and radii controlled by fillets around the window section.

OPERATIONS ON LARGE PARTS

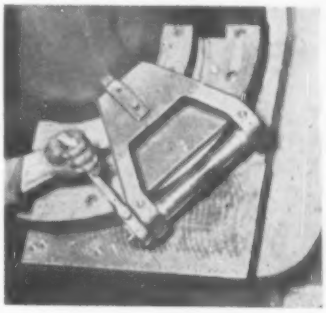
AN EXAMPLE of how a standard table type machine handled a heavy machine part in one setting is illustrated in Figure 2. By the use of a rotary table, all surfaces of the part are milled perfectly square with one another. A second complete index of the table permits drilling, boring and tapping all holes perfectly square with the milled surfaces, and in accurate alignment to each other. The accuracy of the machine and the use of verniers to lay out the hole locations on the pads to accurate dimensions eliminate the need for layout work or special fixtures. Rotary tables on jobs of this type usually show more than a 50 per cent saving over conventional methods or over the use of horizontals without rotary tables.

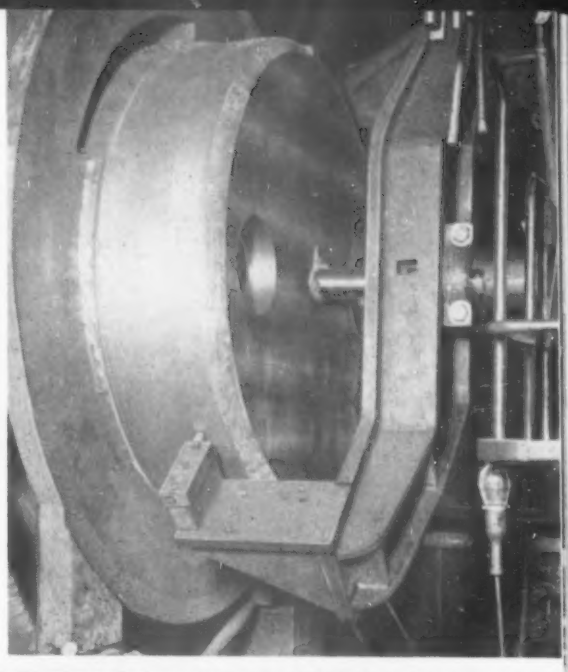
Figure 3 shows a large casting, the base plate of a big shovel. The operations consist of boring for the fulcrum stem of the shovel body and milling the large bearing diameter using a planer type machine. By engaging the correct feed combinations of the headstock and table, it is possible to mill the circular bearing surface. This part, because of its large size must be machined in two settings, since the diameter of the bearing ring exceeds the vertical travel of the headstock.

THE BORE is completed in the first setting, and the bearing surface is milled halfway. After the operations, the part is turned 180°, the finished surface of the bore serves as reference for realignment, and the bearing surface milling is completed.

An excellent example of the range of work that can be handled with floor type equipment is revealed in the description of machining a part so large and unwieldy that it became more practical to move the machine to various parts of the workpiece than to

Right: **FIGURE 4.**
A yoke is used to turn an outer diameter.





***Above:* FIGURE 4a.**
In turning a radius from the outer diameter machined as pictured in Figure 4, a worm-fed segment is attached to the yoke.

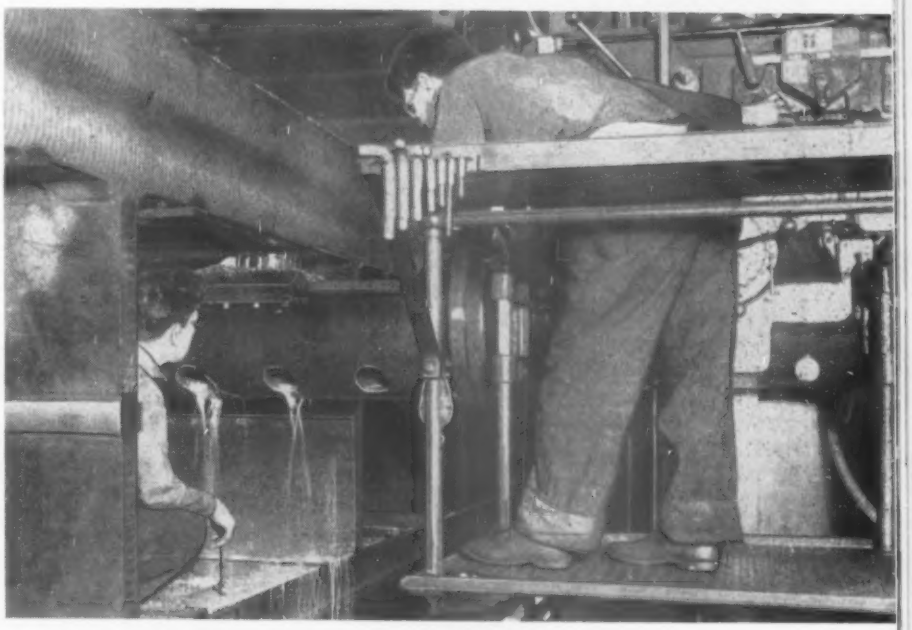
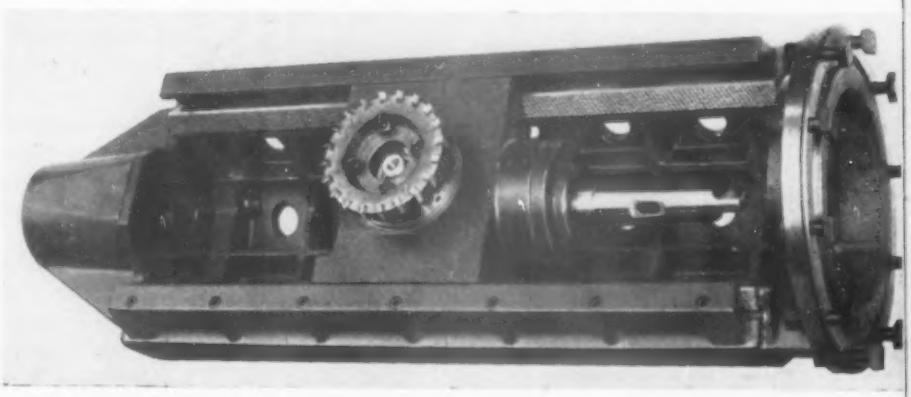


FIGURE 5.
The special right angle milling attachment which is illustrated in Figure 6 permits machining a series of pads inside a large workpiece.

FIGURE 6.
Side milling attachment (shown in use in Figure 5) is fed by spindle of the horizontal boring mill.



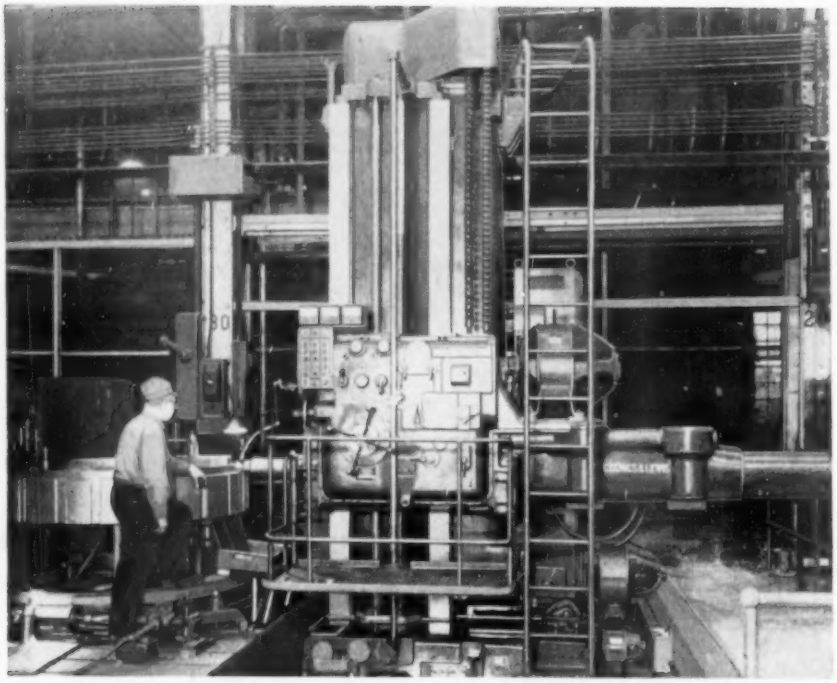


FIGURE 7.
Form-milling rotor slots on a floor-type horizontal boring mill.

workpiece and machine a series of pads extending the full depth on all four sides of each section.

Of particular interest in this installation is the fact that the side milling attachment is fed by the spindle itself. This is accomplished by designing the drive to the spindle head of the slide in the form of a Morse taper which fits the spindle nose (Figure 6). The attachment can be swiveled through 360° and can therefore machine a pad parallel to the spindle at any angle. The part being machined is a large welded steel press bed.

Figures 7, 8 and 9 illustrate the application of a somewhat larger floor type machine to two interesting and unusual jobs. Figures 7 and 8 show

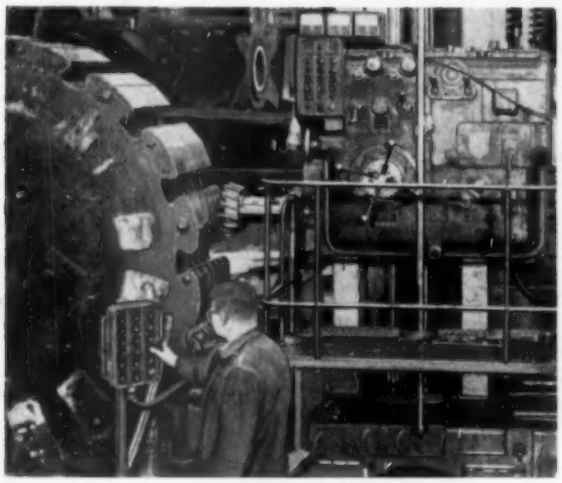


FIGURE 8.
Face-milling the periphery of a rotor.

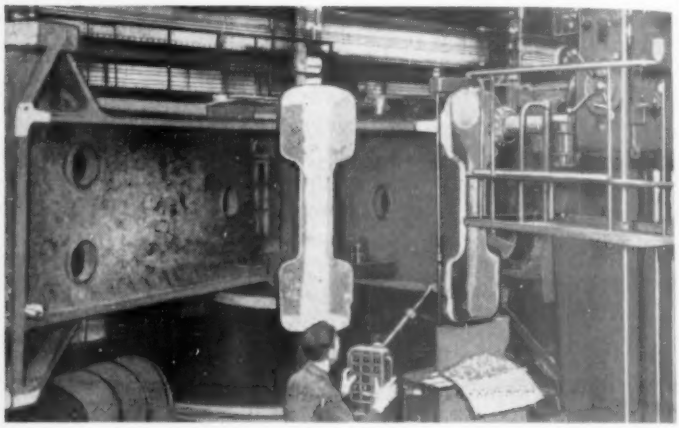


FIGURE 9.
Milling a large spider, which is indexed from arm to arm. The operator controls machine movements from a push-button station.

move the workpiece to the machine. The operation consisted of milling a keyway on the large circular steel housing.

Several of these keyways were machined at various points on the circumference of the housing by merely picking the machine up with a crane, and placing it in position beside the workpiece. Both the machine and the work were placed on a large continuous floor plate.

An ingenious method of tooling has been devised for turning the outside diameter of a large boss on a press part, followed by turning a radius on the same boss all in one set-up (Figures 4 and 4a). A special yoke is applied to the spindle, and provided with a single-point tool for the turning operation. For turning the radius, the yoke is provided with a worm-fed segment. Performing these operations on such a large part would be impossible with any other type of machine tool. A flange back of the boss has previously been face-milled in a similar manner to that shown in Figure 3, that is, with a face mill mounted on the spindle.

Boring operations are also performed in the same setting. On the facing and radius turning operations, the boring bar is piloted in a hole in the center of the workpiece.

An interesting example of the design and use of a special right angle milling attachment is shown in Figure 5. The problem in this installation was to reach inside of the large two different machining operations on a rotor. Figure 7 shows the form milling operation on the rotor slots, while Figure 8 illustrates face milling operations on the periphery of a rotor. Figure 9 pictures milling operations on a large spider which is indexed around from arm to arm.

Although these are but a few of the many diversified and unusual jobs being performed on horizontal boring, milling and drilling machines, they illustrate clearly why equipment of this type is seldom idle.

Combining the ingenuity of the operator and the shop superintendent with the versatility of the equipment itself often results in an ingenious and economic solution to unusual machining problems. THE END

Gears -- Long and Short

H. S. SIZER
ENGINEERING DEPARTMENT
BROWN & SHARPE MANUFACTURING COMPANY

TO PRODUCTION ENGINEERS, "special" gears with their attendant cutting tools, machines, or attachments, gages and extra costs are "special headaches."

However, certain special gears are exceptions on all the above counts. Long and short gears can be cut by using regular cutting tools on any standard gear generating machine such as a hobber, shaper, shaver, or grinder. They can be tested on regular gear charting machines, can be produced as readily as standard gears, and can be put into stock at the same costs.

These long and short gears are cut from oversize and undersize blanks.

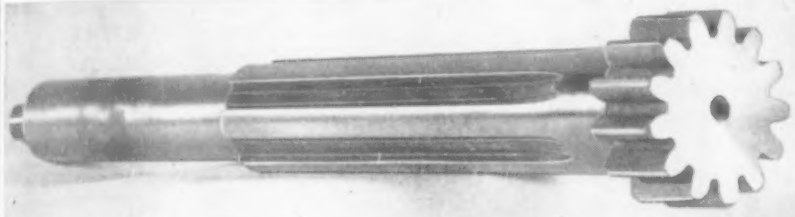
A 13-tooth pinion is cut on a 13½ tooth blank (Figure 1), a 17-tooth pinion on an 18-tooth blank (Figure 2), and a 53-tooth gear on a 52-tooth blank (Figure 3). Technically, they are called long addendum-short dedendum pinions and short addendum-long dedendum gears.

Long and short gears are used:

●1. *To avoid tooth undercut,* thus obtaining complete involute action, smoother operation, and a physically stronger tooth.

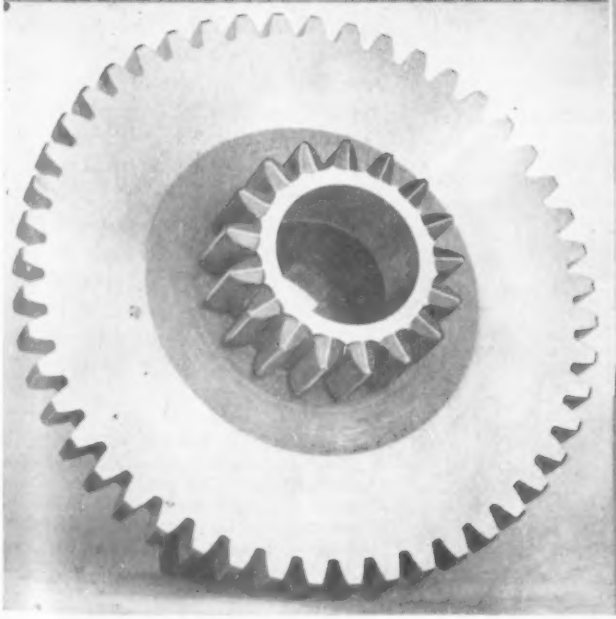
●2. *To make gears run* on existing center distances or to obtain clearances in housings or mechanisms already built. This use is vital in redesign and repair work, especially when modifying standard machines for special purpose work.

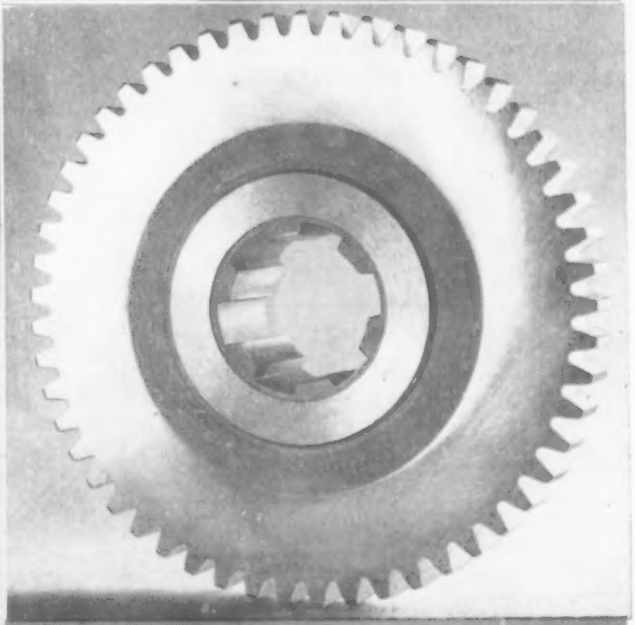
●3. *To get desired or exact gear ratios* in cases where several gear pairs must run between the same centers. With standard gears, the number of teeth to give the desired ratio in one pair of gears is often too few or too many to span the center distance already found satisfactory for the other gear pairs. Long and short gears will reconcile this center distance-ratio conflict in many instances.



Left: FIGURE 1.
Small pinion used to drive a spindle gear. It is a 13-tooth, 12-pitch, 20° pinion cut on a 13.5-tooth blank. Regular 12-pitch master rack and 13-tooth master gear can be employed in the cutting operation.

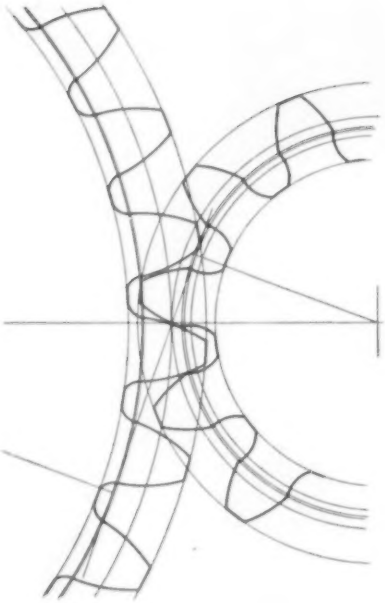
Below: FIGURE 2.
High-strength pinion used to drive bull gear under heavy loads. The pinion is a 17-tooth, 7-pitch, 20° gear cut on an 18-tooth blank. Teeth were cut with standard 7-pitch, 20° cutter in a Fellows gear shaper, and after hardening, were lapped. Internal gear lap was prepared with the regular cutter.





Above: FIGURE 3.
A 53-tooth gear can be cut on 52-tooth blank without robbing it of any involute action. This particular gear was pulled in to permit additional clearance between gear and a casting. Pinion was made oversize.

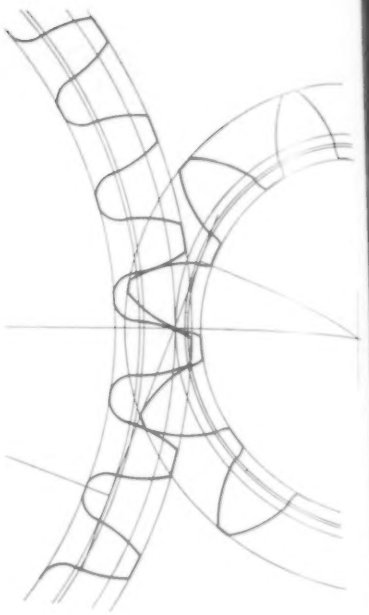
Brown & Sharpe photos and drawings



***Left:* FIGURE 4.**
A 12-tooth, 20° pressure angle pinion in mesh with a 30-tooth gear. Both gears are standard. Pinion teeth are undercut, and a portion of the involute has been swept away by the tips of the hob teeth. Strength of the pinion teeth is 40 per cent of that of a rack tooth, and there is 19 per cent tooth overlap.

•

***Right:* FIGURE 5.**
A 12-tooth oversize pinion cut on a 13-tooth blank running at the same center distance, meshing with a 30-tooth undersize gear cut on a 29-tooth blank. Undercut in pinion is eliminated, and strength of the tooth becomes 64 per cent that of a rack tooth, or about 60 per cent better than that of the standard pinion. Gears now have a greater angle of action with a tooth overlap of 43 per cent, or 1.43 teeth in contact.



IMPROVED TOOTH FORM

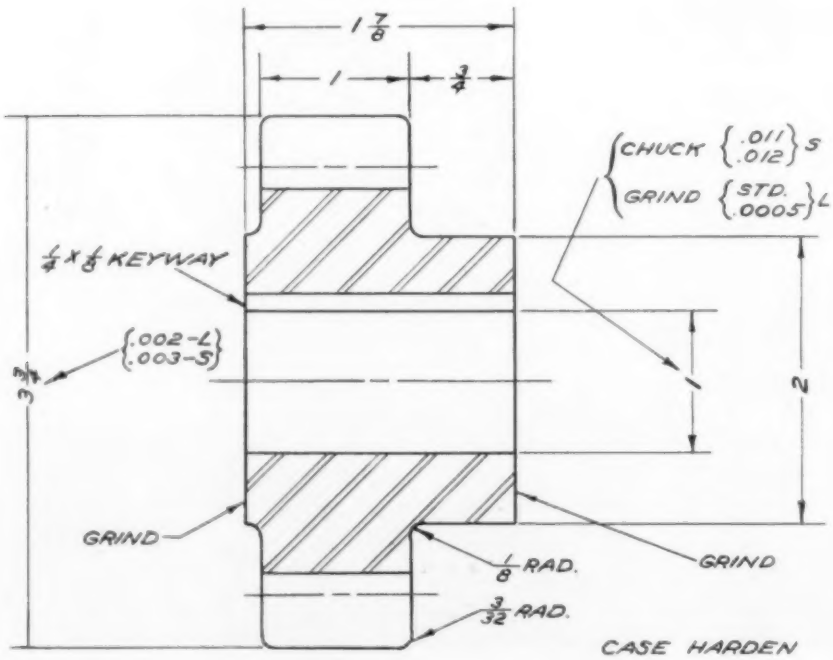
FIGURE 4 SHOWS a 12-tooth, 20° pressure angle pinion in mesh with a 30-tooth gear. Both gears are standard. The pinion teeth are undercut and a portion of the involute has been swept away by the tips of the hob teeth. The strength of the pinion teeth is 40 per cent of that of a rack tooth and there is 19 per cent tooth overlap, or 1.19 teeth are in contact. Figure 5 illustrates a 12-tooth oversize pinion, cut on a 13-tooth blank running at the same center distance, meshing with a 30-tooth undersize gear cut on a 29-tooth blank. Undercut in the pinion has been eliminated and the strength of the tooth becomes 64 per cent of that of a rack tooth, or about 60 per cent better than the standard pinion. The gears now have a greater angle of action with a tooth overlap of 43 per cent, or 1.43 teeth in contact.

To produce these tooth forms, a standard 4-pitch, 20° pressure angle hob was used. The hobbing machine was set up as it would be for a standard 12-tooth gear. Speeds, feeds, index gearing, and swivel angle of the hob slide are all set for a standard gear. The hob is sunk in for the usual 4-pitch whole depth of .539, measuring from the outside diameter of the blank. Since the blank is oversize, the hob will stand off from the pinion axis a distance of 1/21" or .125 more than it would with a standard pinion. A gear drawing for this 12-tooth, oversize pinion is given in Figure 6.

Figure 1 shows a small pinion used to drive a spindle gear. It is a 13-tooth, 12-pitch, 20° pinion cut on a 13.5 tooth blank. The pinion was cut with a standard hob and the teeth ground in a Pratt & Whitney gear grinder. The fact that the pinion is special, does not affect the master gears used for the grinding operation, and the regular 12-pitch master rack and 13-tooth master gear can be used. The tooth form of the pinion is good and it operates smoothly at 3600 rpm.

Figure 2 illustrates a high-strength pinion used to drive a bull gear under heavy loads. The pinion is a 17-tooth, 7-pitch, 20° gear cut on an 18-tooth blank. Teeth are cut with a standard 7-pitch-20° cutter in a Fellows gear shaper, and after hardening were lapped in a Fellows gear lapper. Internal gear lap was prepared with the regular cutter and no exception had to be made because the lap was to be used on this oversize or special gear.

An oversize pinion such as that shown in Figure 5, can operate with any gear cut with a hob or generating cutter of the same pitch and pressure angle. It can run with an undersize



***Left:* FIGURE 6.**
A 12-tooth, oversize pinion, hobbed on a 13-tooth blank. This pinion runs with a 30-tooth gear cut on a 29-tooth blank. Maximum backlash is .005". Standard hobbing equipment is employed, but since the blank is oversize, the hob will stand off from the axis a distance of 1/21", or .125 more than with standard pinion.

gear as shown here, with a standard gear, or with another oversize gear. If the mating gear is made as much undersize as the pinion is oversize the pair will run at standard center distance, calculated from the number of teeth for which the blanks were turned, and not from the actual number of teeth.

Although these spur gears are unusual or special, the basic principle of favoring a pinion by using a large blank and stealing from the gear which is usually large enough to show no ill-effects of the loss, is old. The Gleason system for bevel gearing employs this principle, and gears in helical-gear speed reducers have long been made in this manner.

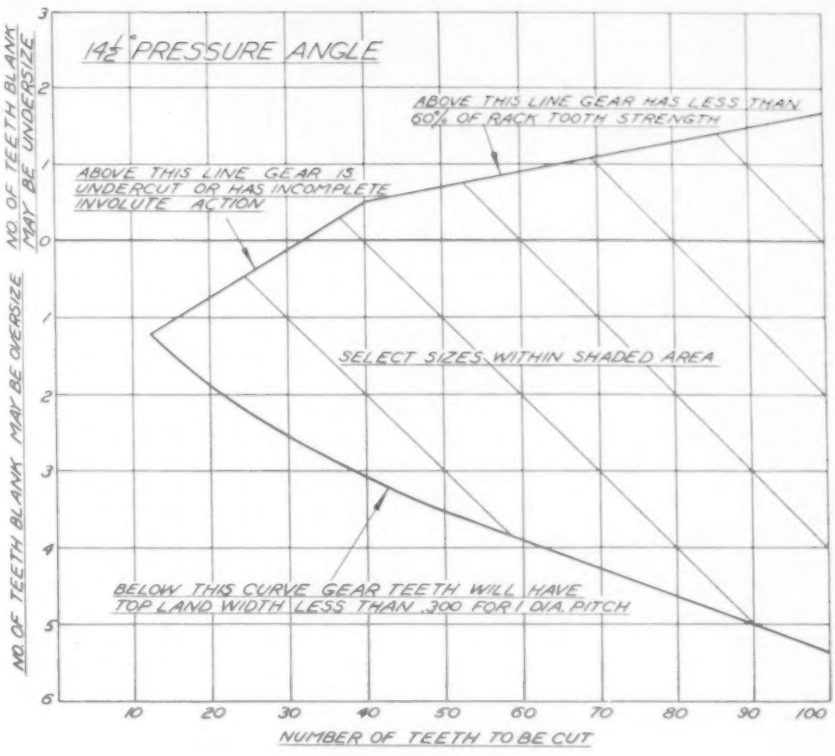
How far can one go in making a pinion oversize? The limit is that point at which the tips of the teeth become knife edged. The tendency toward smaller top land widths can be seen in comparing the pinions shown in Figures 4 and 5. A practical width of land has been set as .300 for 1-pitch or .030 for 10-pitch. Accepting this limitation for tip width, pinions can be made oversize by the amounts shown in the charts of Figures 7 and 8. Typical values are: A blank 1-tooth oversize for a 16-tooth, 14-½ degree pinion, or one 2.8-tooth oversize for a 40-tooth, 20-degree pinion.

MAINTAINING CENTER DISTANCES AND CLEARANCES

OVERSIZE AND UNDERSIZE GEARS are useful in maintaining given center distances, in obtaining necessary clearances, or in providing body metal where it is seriously needed. Examples best illustrate this.

For instance, a gear shaft should be made as large as possible to obtain rigidity for the several gears mounted on it. With the smallest gear however, there is too thin a ring of metal under the teeth. By cutting the gear on an oversize blank more root metal can be obtained for the gear teeth. Figure 9 shows such a gear. It is an 18-tooth 10-pitch, 20-degree pinion cut on a 19-tooth blank.

Had a standard gear been used, the thickness of metal between the root diameter of the gear teeth and the major diameter of the spline would have been .119. This would have been too little and the supporting ring of metal under the teeth would have failed before the teeth reached their maximum permissible loading. By using an oversize (19-tooth) blank the


14½° PRESSURE ANGLE
ABOVE THIS LINE GEAR HAS LESS THAN 60% OF RACK TOOTH STRENGTH
ABOVE THIS LINE GEAR IS UNDERCUT OR HAS INCOMPLETE INVOLUTE ACTION
SELECT SIZES WITHIN SHADED AREA
BELOW THIS CURVE GEAR TEETH WILL HAVE TOP LAND WIDTH LESS THAN .300 FOR 1 D/A PITCH
NO. OF TEETH BLANK MAY BE OVERSIZE
NO. OF TEETH BLANK MAY BE UNDERSIZE
NUMBER OF TEETH TO BE CUT

Above: FIGURE 7.
A practical width of land has been set up as .300 1-pitch, or .030 for 10-pitch. Accepting this limitation for tip width, pinions can be made oversize by the amounts shown for 14½° pressure angle.

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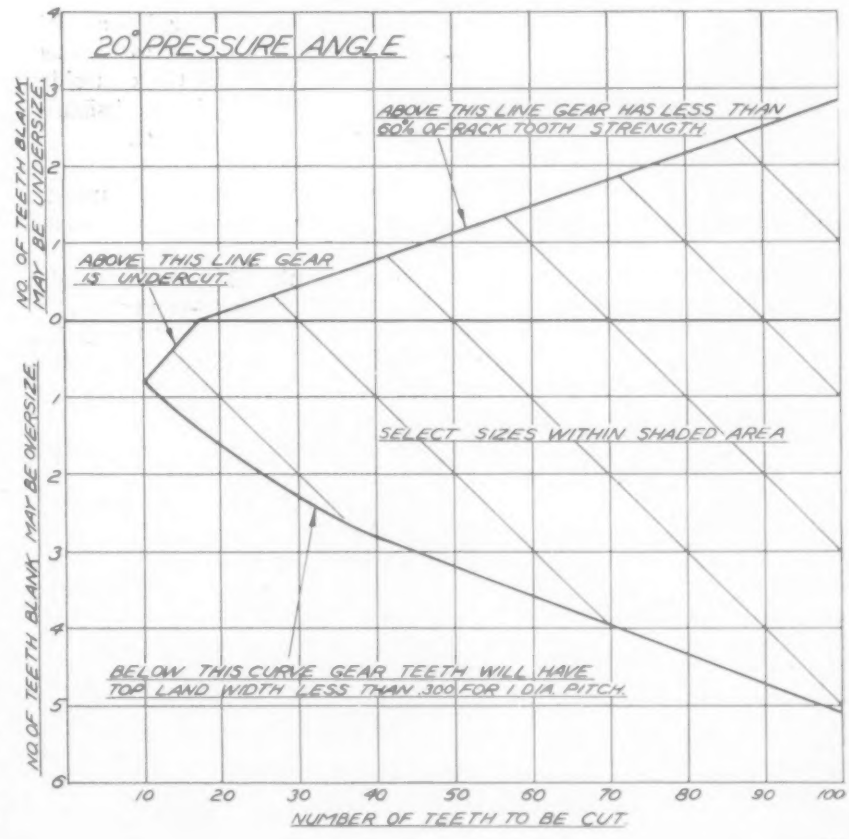
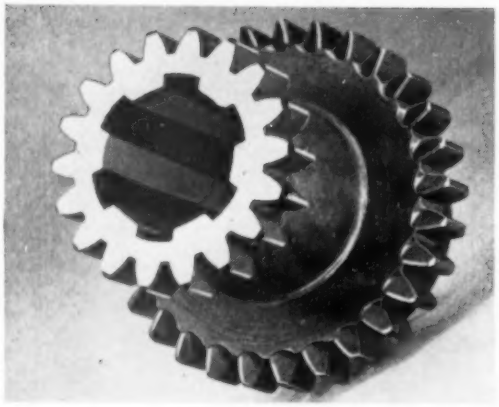
Below: FIGURE 8.
Accepting .300 for 1-pitch, and .030 for 10-pitch, as a practical width of land, pinions can be made oversize by the amounts shown for 20° pressure angle. A typical value is 2.8 tooth oversize for a 40-tooth, 20° pinion.


20° PRESSURE ANGLE
ABOVE THIS LINE GEAR HAS LESS THAN 60% OF RACK TOOTH STRENGTH
ABOVE THIS LINE GEAR IS UNDERCUT
SELECT SIZES WITHIN SHADED AREA
BELOW THIS CURVE GEAR TEETH WILL HAVE TOP LAND WIDTH LESS THAN .300 FOR 1 D/A PITCH
NO. OF TEETH BLANK MAY BE OVERSIZE
NO. OF TEETH BLANK MAY BE UNDERSIZE
NUMBER OF TEETH TO BE CUT



***Left:* FIGURE 9.**
A gear shaft should be made as large as possible to obtain rigidity. With the smallest gear, however, there is too thin a ring of metal under the teeth. By cutting the gear on an oversize blank, more root metal can be obtained. The part illustrated is an 18-tooth gear cut on 19-tooth blank.

•

***Below:* FIGURE 10.**
Special gears solve some of the designing problems in working out compact mechanisms.

RATIO	BEST SOLUTION WITH STANDARD GEARS 420T TOTAL	SPECIAL GEAR SOLUTION NO PINION BEING SMALLER THAN 17T 120T TOTAL	SPECIAL GEAR SOLUTION ACCEPTING A 12T PINION 84T TOTAL
1 TO 2	140 x 280	40 x 80	28 x 56
1 TO 3	105 x 315	30 x 90	21 x 63
1 TO 4	84 x 336	24 x 96	17 x 68
1 TO 5	70 x 350	20 x 100	14 x 70
1 TO 6	60 x 360	17 x 102	12 x 72

minimum thickness of the ring section is .169, a value more consistent with the breaking strength of the teeth.

A second example is a 6-pitch, 53-tooth, 20° bull gear which runs close to a cast machine wall. Casting variations are worse than anticipated and interferences occur. Too much time is being wasted in grinding clearance. What can be done besides changing patterns and alternating fixtures?

A 53-tooth gear can be cut on a 52-tooth blank without robbing it of any of its involute action. (See Figure 3). If the bull gear is made small and the driving pinion large, the outside diameter of the gear can be pulled in by one tooth, thus obtaining an additional .083 clearance between the teeth and the casting. New machines are not usually designed so close to the line, but on redesign and correction work, such gear moves can prove helpful.

Frequently it is necessary to reduce the size of a gear to clear some member of the mechanism, or to get the gear through a limited assembly hole. The amount it is permissible to reduce blank sizes is shown in Figures 7 and 8.

Blank size should not be reduced unless there are more than 32 teeth in a 14-½° gear, or over 17 teeth in a 20° gear, since to do so would introduce the same undercut which the reduction is intended to eliminate in small pinions. From the curves it is seen that the 53-tooth gear previously described could have been made as much as 1.2 teeth smaller in its blank size. The limit to the amount which a gear may be made undersize has been set at that point where the gear teeth will have a strength equal to 60 per cent of the strength of a rack tooth or equal to the full strength of a standard 17-tooth pinion. In cases where gear strength is not the controlling factor in design, it is permissible to work above the curve given.

•

The following example illustrates the problem of maintaining a center distance:

A 24-tooth, 10-pitch, 20° pinion has been driving a 48-tooth mate. Experience indicates that 10-pitch is a little weak and that 8-pitch is needless for extreme loads. Keeping the same center distance and the same 1 to 2 ratio, how can 8-pitch gears be worked in?

To span the 3.6″ center distance, a total of 57.6 8-pitch teeth would be required. Since gears must have whole numbers of teeth, it is certain that standard gears cannot be used. The 1 to 2 ratio can be obtained with a 19-tooth, 38-tooth pair of gears. To get these to operate at a 57.6 tooth or 3.6″ center distance, one of the gears must be made oversize. Using the principle of favoring the pinion, it is best to cut the 19-tooth gear on a 19.6-tooth blank and the 38-tooth gear on a standard blank. If this is done the gears will operate at the exact center distance which exists, and, at the same time, an oversize pinion is obtained which in form and strength is superior to a standard 19-tooth pinion.

EXACT GEAR RATIOS

IN SLIDING gear mechanisms or in pick-off gear designs, several gear pairs must operate on the same centers. The designer usually adopts a center distance which will permit most of the ratios to be obtained. There are, however, likely to be one or two ratios which cannot be obtained accurately with the number of teeth required to span the center distance.

For a simple example, five gear pairs having exact ratios; 1 to 2, 1 to 3, 1 to 4, 1 to 5, and 1 to 6, are to run on the same center distance. With standard gears, a tooth total of 420 becomes necessary for each gear pair. This is a mathematically correct solution, but not practical when working out compact mechanisms. Using oversize and undersize gears, the problem has some excellent solutions. For two of them, see Figure 10.

Where a 120-tooth total is employed, the 17-tooth gear is cut on an 18-tooth blank to span the center distance. This is the only special gear required.

Accepting a 12-tooth pinion as the smallest driver, the 84-tooth solution is possible. To run at a 84-tooth center distance, the 68-tooth gear must be cut on a 67-tooth, or undersize, blank. It is also desirable to cut the 12-tooth and 14-tooth pinions on slightly oversize blanks to avoid undercutting, stealing whatever is necessary from their large mating gears. This last move, however, has nothing to do with ratios. It is made only to improve pinion forms.

THE END

Rough Machining Gear Blanks

● A method of rough machining gear blanks in an engine lathe permits seven machining operations with one stop setting at a General Electric plant. A 16-inch lathe, equipped with chuck and spindle back-stop is used. Chucking the previously ground face of a gear stock against the spindle back-stop provides a stop constant for seven operations.

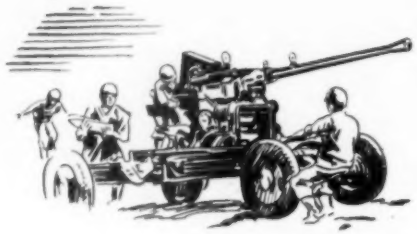
PRODUCTION

MACHINE AND TOOL ENGINEERING

Delivery of turret lathes in machine shop of gun mount plant which is devoted to producing Bofors anti-aircraft guns.

"BETTER JIGS AND FIXTURES"

Improved tooling by Firestone Tire & Rubber Company production engineers is increasing output of guns on standard machines and tools. Beginning with limited jobbing shop experience, they have performed an outstanding production job



Streamlined

RESULTS STORY:

Facts on industrial achievement indicate production ingenuity

A SMASHING ONE-PAGE RESULTS STORY reveals the effect of streamlined tooling on production of Bofors anti-aircraft gun mounts and assembly of complete guns by The Firestone Tire & Rubber Company. When the present quota was first reached, Firestone employed 2300 people to fabricate 60 per cent of the parts and assemble the whole unit. Forty per cent of parts manufacturing was sub-contracted.

The quota attained, a job which had required the full energies of this company's tool and production engineers, the next task was that of streamlining methods. Improvements in production techniques resulted in meeting the same quota with 1200 employees, and with only 25 per cent of the parts sub-contracted. Improvements are still being made.

With few exceptions, these amazing savings were made without acquisition of additional equipment. Though increased skill of machine operators was undoubtedly a factor, 90 per cent of the progress must be credited to day-to-day refinement of jigs and fixtures which converted standard jobbing shop equipment to high production. The details of change are hard to trace. To the engineers on the job the story was one of a change here, another there, and most of it all in the day's work.

The "why" of the story is apparent, however. Firestone could employ little skilled help. That meant that jigs and fixtures had to be fairly fool-proof, that about all that could be expected of a machine operator was the ability to load the parts into a jig, and to start and stop the machine. Definite location points, positive stops, and designation of simple graduations on a scale had to be the working details of each job.

The "how" of the story concerns machine, jig and fixture combinations which have enabled this company to establish a production economy which realizes full advantage from manpower, machines, and materials.

Two other factors serve to preface details of Firestone's production know-how. One concerns the qualifications of a rubber tire manufacturer for mass production in the metal-working field. The other factor covers the product design changes which permitted an approximate 100 per cent reduction in production time over that required to manufacture to British design.

As a tire manufacturer, Firestone is expert in production staging. The ability to develop a precisely timed sequence of operations is part of this company's stock in trade. Operations must be balanced so that the full potential of every machine or production line is fully realized, including recognition of a maintenance factor. In other words, equipment is set up, so that its operation cycle and its position in the plant layout is in close relationship to all other equipment.

Because the basic factors of time-study and plant layout are essentially the same for all production processes, Firestone's knowledge of these factors was of tremendous help in setting up a mass manufacturing and an assembly sequence in metal-working. Where production of certain parts of the Bofors gun fell into the jobbing shop classification, the production engineers tapped Firestone's experience in building and maintaining tire manufacturing equipment.

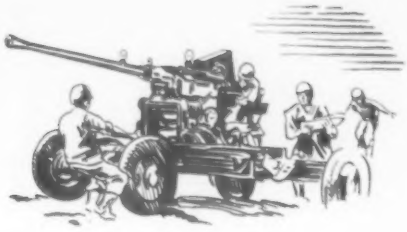
A HANDFUL OF KEY MEN from the Firestone machine shops was transferred to the embryo gun mount division as department managers, foremen and job setters, and machine operators. They trained unskilled help to operate vertical boring mills, milling machines, turret lathes, radial drills, and grinders.

Concurrently with the job of organizing for production, Firestone re-designed the product to save materials and to facilitate manufacture. The greatest single change was made in abandoning the British method of riveting the top carriage structure in favor of welding. Eleven-gauge plates welded together by means of 3/16″ stay separators formed the side walls, which in turn were welded to the base.

With the British method, the round base plate had been forged. Firestone changed to casting, and then re-specified pressed steel fabrication. Not only was machining reduced from an all-over job to one of finishing relatively few bearing surfaces, but machinability was improved.

The gear sector, part of the mechanism used to elevate the breech and barrel, was originally constructed by the British from two thicknesses of plate, spaced and rein-

SPECIAL FEATURE BY THE EDITORS



forced by internal ribs. As redesigned by Firestone, required strength was obtained from a single plate reinforced by external ribs.

Much vital material, such as the bronze in the main ring gear—specified to combat corrosion—was replaced by steel. In this instance, it was corrosion-proofed. Malleable iron replaced bronze castings, such as gear housings.

Specification changes were sometimes made because there was no actual requirement for the close limits to which some parts were held. For example, on the worm shaft in the elevating gear mechanism, original prints called for a machine finish to .003″ limits. Since a ¾″ clearance exists between the shaft and housing, in the working mechanism, no machining was actually required except to develop clearance and that is all that was re-specified.

Design changes were not unimpeded. Need for conversion from metric to the American system, and specification of low alloy metals which could be brought up to required physicals by heat treatment were time-consuming jobs. But progress was phenomenal. Four months after receipt of a combination of Swedish, English, and Canadian prints, two pilot models were turned out.

Man-hours reduced 48% by BETTER JIGS AND FIXTURES

Combining limited metal-working experience with keen understanding of production factors, a leading tire manufacturer has applied common-sense tooling ideas to building Bofors anti-aircraft guns. Practical methods described here may be helpful in other fields

FABRICATION

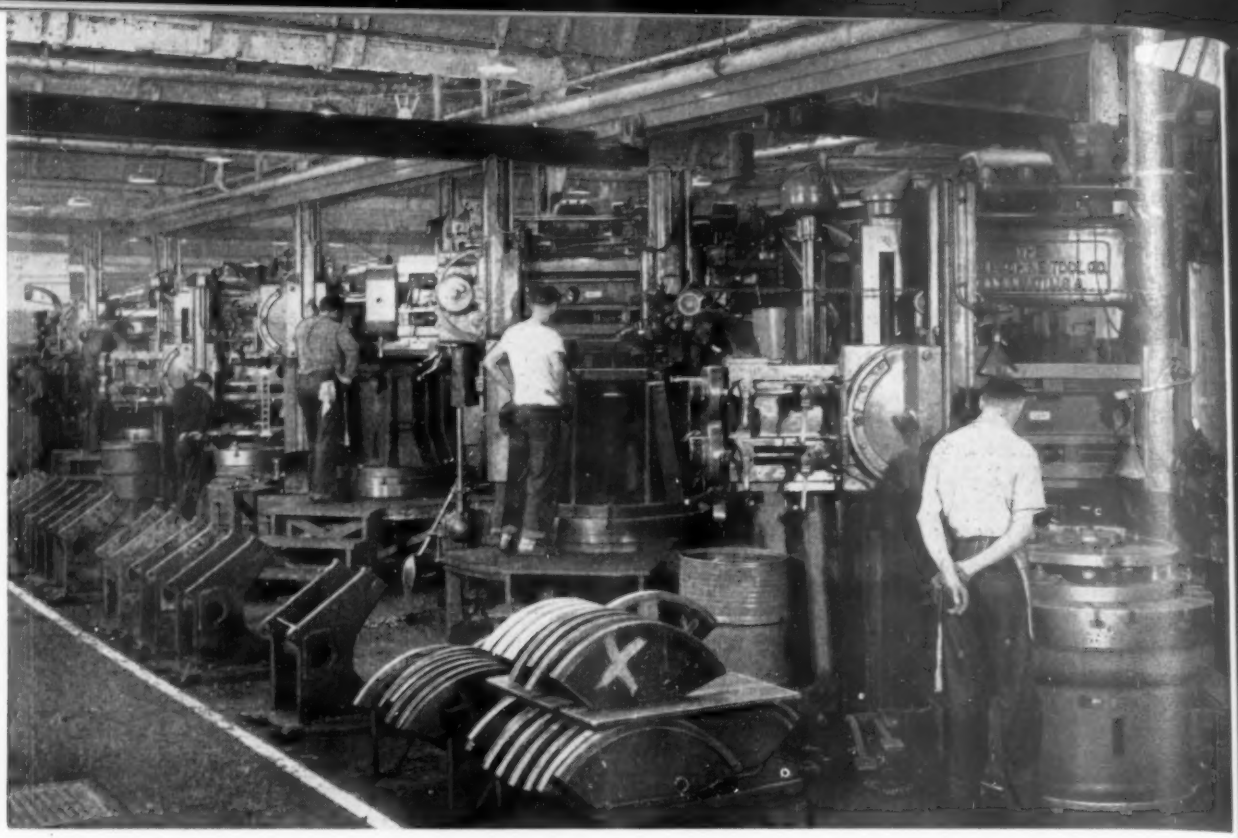
WITH FEW EXCEPTIONS, the Firestone Tire & Rubber Company's Gun Mount Division is performing the entire job of machining Bofors anti-aircraft gun parts on standard machine tools. Attaining high production with unskilled labor has been the result of ingenious tooling, with emphasis on design and almost continual refinement of sturdy jigs and fixtures. These permit quick and positive location of the work.

A simple routine involving manipulation of conventional clamping devices, starting and stopping the machine, and perhaps the indexing of the fixture, is typical of the requirement upon the machine operator.

Though production per machine on certain parts may fall short of the output which might be expected of special purpose equipment, relatively high output is obtained from the standard vertical turret lathes and boring mills, drill presses, radial drills, and milling machines which Firestone was able to obtain and put into service following acceptance of the contract.

Firestone photos

Firestone introduced welding to speed production of top carriage. In foreground are seen positioners for joining two walls of side member. Ovals on surface indicate positions of stay separators which join plates. Welders in booths are producing large elevating gear sectors.



Battery of horizontal boring mills, equipped with tool turrets for machining Bofors all-welded top carriage.

When semi-special-purpose machines, applicable to the jobs at hand, have been available, Firestone's tool engineers have put them to work. A hydraulically controlled, 3-way horizontal boring machine, operated one shift per day, has eliminated three milling machines which were operated almost continually through 24 hours. The job consists of finish boring and facing on three faces of the cube-shaped traversing gear case. One of the bores has an internal flange or shoulder. The three faces are rough turned and the holes rough bored on standard milling machines. The part is then clamped in a fixture on the 3-way boring machine, for finish machining.

EACH HEAD CARRIES boring and facing tools, the latter feeding out from the center, beginning their cut at the periphery of the bored hole. Upon completion of the boring operation, the facing tools have been brought into contact with the work faces, and the heads ceases to advance. The spindles continue to revolve, however, and the facing tools feed within the heads in planes perpendicular to the axis of the spindles.

Not only were more machine and man-hours required in the previous method of finish-machining this part, but scrap was running high because of the difficulty of milling faces parallel on separate set-ups. The three bores are held to limits of .001" from each other on their centerlines.

Multiple-spindle drilling machines, a battery of automatic lathes, and automatic screw machines are included in the list of high production equipment which has been installed to machine Bofors gun parts. Turret lathes and radial drills, as well as conventional gear cutting, shaving and grinding equipment are included. Gears must be finished so that backlash cannot be detected. No other equipment can be used feasibly.

Essentially, the problem which faced Firestone was almost entirely one of doing a high production job without high production equipment. Obviously, whether a machine is or is not capable of high output frequently depends upon the job required of it. Production engineers in the gun mount plant utilize to the fullest extent such potentially high activity equipment as large surface grinders to relieve the burden on smaller machines. In reducing the thickness of spacer rings, having a 1" O. D., a 36" surface grinder can machine as many as 50 to 100 parts simultaneously. The saving, compared to the output if the job were put on a lathe or other machine, is tremendous

GENERALLY, however, single operation machines are performing the bulk of the work. Radial drills are worked to fullest capacity through the application of indexing fixtures. Holes are tapped in the outer periphery of a large bearing register ring by using a vertical holding plate which can be indexed through a vertical plane to positive stops. Bushings are incorporated into the holding jig which is clamped over the work.

On the table of another radial drill press, an indexing fixture is set up which offers the operator three locations of the same parts, in succession. As holes are drilled or tapped in one piece, the fixture is indexed to bring up the next part, clamped to expose a second or third side. An operator is kept busy loading and unloading pieces, changing the positions of two parts and unloading a third at

each indexing, a good example of Firestone's methods.

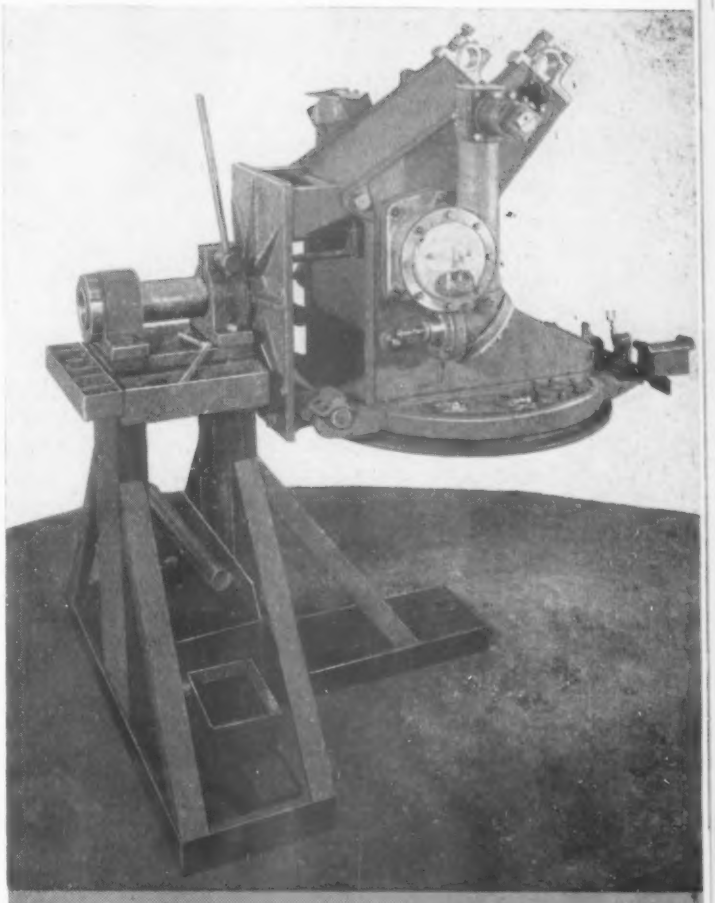
Where a machine is involved full-time in producing a particular part, the fixture remains on the machine table. Where three to 10 different parts may be produced in short run lots, the machine operator learns the various jobs through the movements required to set the work up in a jig, almost always working to set stops or graduations.

In certain departments, where set-up requires a degree of skill, set-up men are employed at a ratio of one to every nine men operators, one to every six women operators.

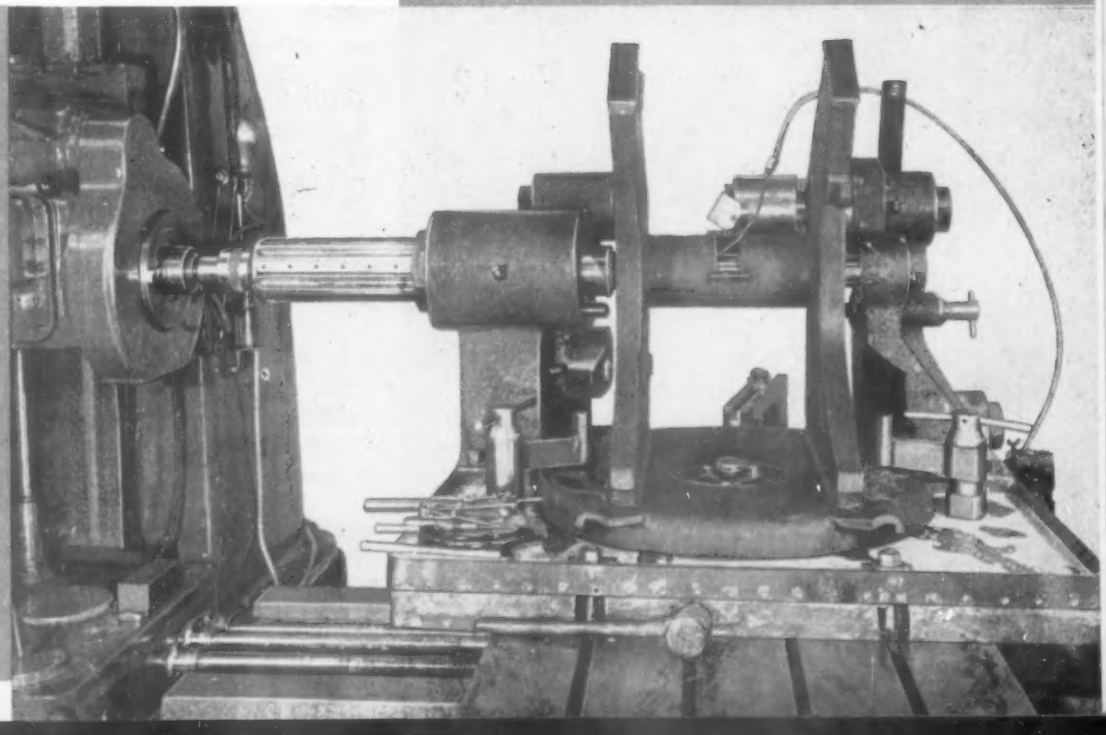
AN INTERESTING SIDELIGHT, however, on the approach to the job by relatively unskilled workers is in regard to their limited understanding of tolerances. Confronted with limits figured in tenths of thousandths, the inexperienced man is impressed, but has little doubt of the machine's capacity. His failure to remain within limits is as much a reflection on the tool or production engineer as on himself, for if machine and tools are properly set up to the job, he will work to it generally without hedging. On the other hand, the experienced machinist has been known to suffer from the psychological factor imposed by obstacles which he readily imagines.

Following the general machining and fabricating sequence on three major parts, each typical of certain types of operations, indicates the methods and machines which have been applied to the gun mount job.

The top carriage is the largest single part, presenting problems of materials handling and of developing close relationships between surfaces at some distances from each other. Serving as a trunnion carriage for the elevation of the breech and barrel, it also turns on the 21" bearing ring for traversing action. This part is produced on equipment which has been specially jigged to handle it.



Gear case, a complete sub-assembly, is mounted on the top carriage. Use of a modified trunnion fixture is helpful in assembling parts on heavy welded structure.



Boring 5" hole for assembly of the elevating gear case of the top carriage of the Bofors anti-aircraft gun.

Streamlined Production

The elevating gear casing is a casting of awkward shape. Requiring machining to close limits, it too is manufactured on a production line set-up.

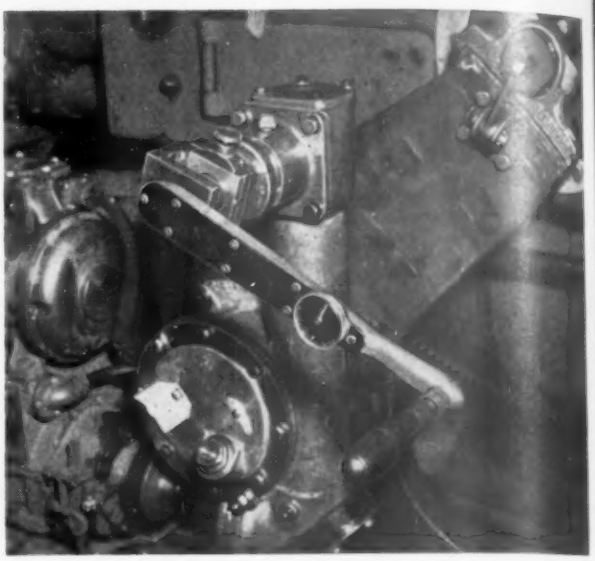
The worm shaft, which transmits the main power drive within the elevating gear casing, represents in part the output of the jobbing departments.

PRODUCTION of the top carriage begins with arc welding. Basically, the part consists of two parallel, angular shaped sides, joined by a center tubular member, all three being mounted on a pressed steel base. Each side is a welded fabrication, built from two parallel plates of 11-gauge steel, spaced by several 3/16" stays.

Slots are blanked in the plates for the insertion of the stay separators which are welded to the plates by hand, each end being flush with outer surfaces of the locations being selected, insofar as sequence is concerned, so that there are no heat accumulations or concentrations which would result in excessive distortions of the completely assembled side member.

Sides are tack welded to each other and to the base plate with the aid of positioners which permit rapid work from an advantageous position. Complete welding of the aligned structure follows. The finish welded top carriage is stress-relieved in an oven in the department.

The top carriage structure is gaged, and straightened if necessary, in a press which consists of four vertical columns. Hydraulic jacks extending inwardly and horizontally from each of the columns are available to apply pressure at the extremities of the sides if mis-alignment is indicated by locating bars which swing from hinged positions.



Checking elevating gear mechanism for torque.

The first machining operation on the top carriage consists of rough- and finish-facing the bearing register on the bottom of the base plate, including rough- and finish-turning of a 21" external diameter. Five vertical boring mills, with 52" tables and turret heads, are required to meet the present production quota. Particular care is taken in this operation, not only because of the importance of the surface to the working of the gun, but also because it serves as a locating surface for further machining operations.

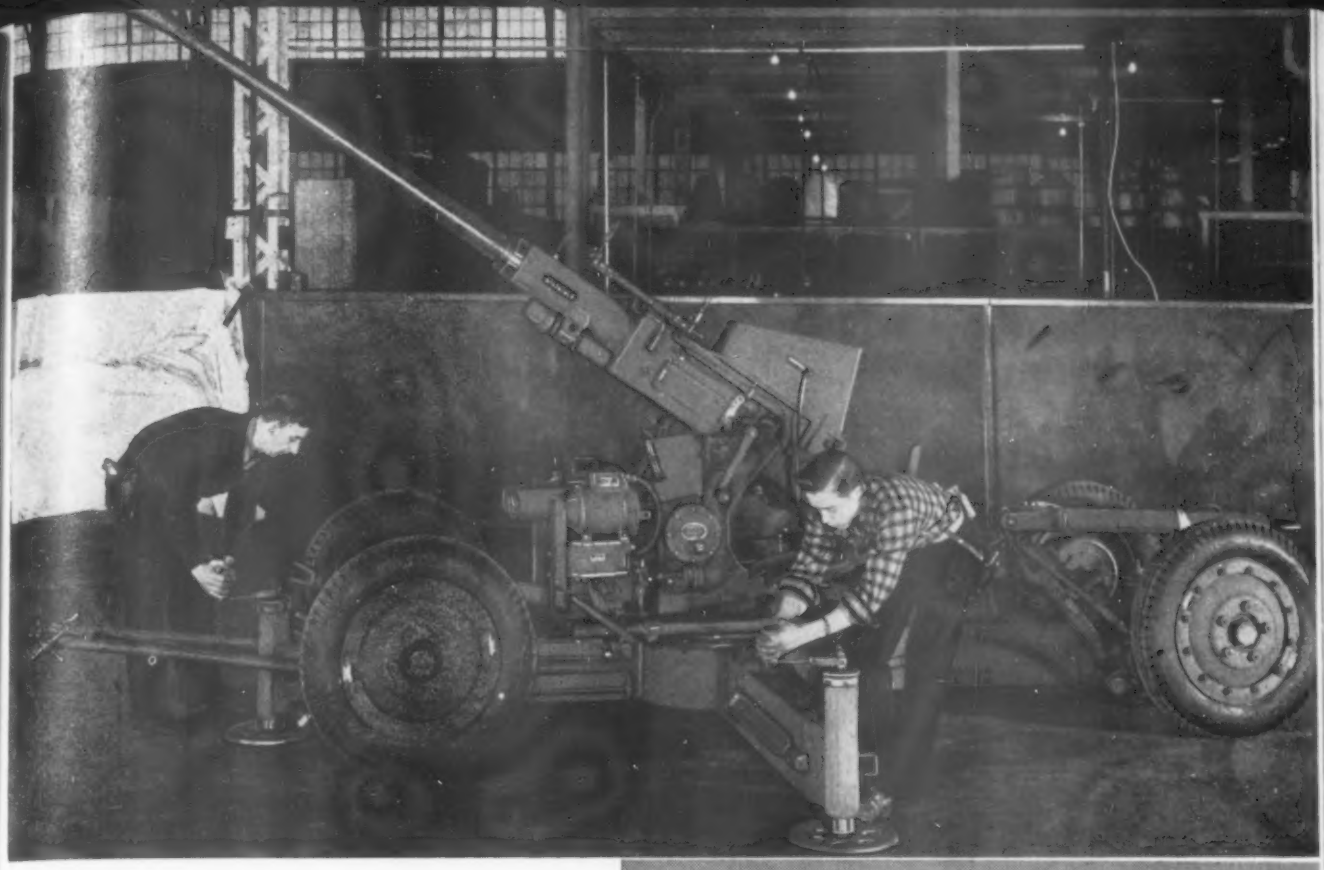
The part is inverted in a jig which bears on side and top surfaces in such a manner that it serves as a secondary check on alignment.

A tolerance of .003" is permitted in machining the bearing register. Fine limits on boring and milling jobs are not new to Firestone's tool engineers. Similar set-ups and tolerances are continually encountered in producing and maintaining tire molds and other tire fabricating equipment.

SUBSEQUENT OPERATIONS for the complete machining job on the top carriage consist of forming, cutting to length, and facing lugs on a planer type mill. Two other planer mill operations—on separate machines—include straddle milling large pads on each end of a 5" hole, and facing pads on the base or turntable. The same design fixtures are used on the three planer mill set-ups.

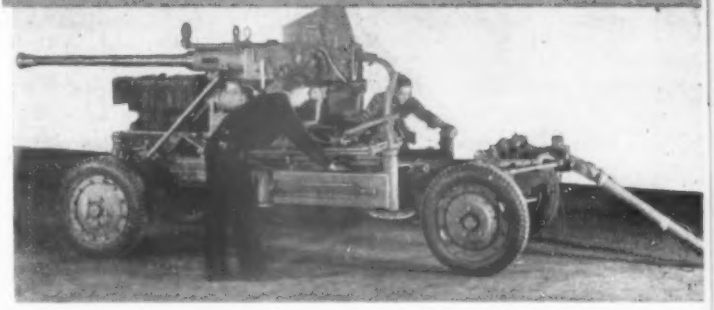
Six horizontal boring mill operations complete surface finishing. These are set up to mill a rectangular pad on the turntable; to mill pads on right and left hand sides; to bore and ream three 1-¼" holes, face pads inside and

Worm shafts for elevating gears are checked carefully. In background is shown thread grinder which produces worm gears to an accuracy of 15 minutes on the helix.



Above: **Setting up gun in firing position for final inspection.**

Below: **Complete Bofors anti-aircraft gun in traveling position.**



out, and bore, ream and chamfer a 5″ hole; to mill face and sides of pads around 5″ hole (holding close limits between surfaces on separate sides); to mill pads on right and left sides; and to straddle-mill trunnion brackets, holding to close limits between surfaces on separate sides.

THE NEXT SEVEN SET-UPS provide for drilling, reaming, tapping, countersinking, and chamfering in pads and flats prepared on surface finishing operations. With the exception of drilling 14 holes of ½″ diameter on a multiple spindle machine, and drilling, chamfering and tapping one hole with a hand drill, these operations are performed on radial drill presses. A variety of fixtures and jig plates are required to locate the work.

Before the work is moved to final inspection; burring and washing operations are performed.

Throughout machining on stationary fixtures, fixed set-up blocks and dowel pins in regular locations eliminate need for lay-out or set-up measurements.

Production improvements on machining the cast elevating gear casing have reduced machining time at least 200 per cent. Refinements on holding fixtures and the increased use of carbide-tipped tools have been responsible. Typical of the equipment used in machining this part are standard vertical turret lathes, horizontal boring mills, and radial drill presses. In two instances, tolerances of .0002″ are specified, where a press fit is required for ball bearing retainer rings.

Most of the operations on the vertical turret lathes call for machining off the center of gravity, so that it has been necessary to counterbalance the work-holding fixtures in order to take full advantage of potential machining speed. Large blocks of lead provide a proper distribution of weight.

Several indexing fixtures have been developed which simplify the set-up job and provide greater accuracy than could be obtained in setting up the work for each of the several operations. In rough and finish machining the worm shaft bores and adapter bearing bore on a horizontal boring mill, the work holding fixture indexes positively 90° from one position to the next.

An additional aid to accuracy on this and other operations is the use of interchangeable boring bars for the rough and finish operations. With tools set for the job, the only down time between roughing and finishing is the

Steady flow of completed Bofors anti-aircraft guns is the result of well-staged, nicely-timed production operations. The careful planning which is all-important to manufacture of rubber products was undoubtedly of help to the Firestone company in this war-time job.

few seconds required to insert the proper boring bar.

In drilling and tapping the gear casing, an indexing fixture is used in conjunction with a radial drill press which provides for turning the work in four different positions. Positive stops relieve the operator of set-up in each instance.

A 2-way, completely automatic boring machine performs finishing operations on the gear casing in one fifth the time required when the job was set up on a lathe or milling machine.

FIFTEEN MACHINING OPERATIONS complete the sequence on the gear casing. The first five and the tenth machining operations include all the turning, facing, and milling necessary to finish surfaces. Three of the operations are performed on vertical turret lathes, two are performed on automatic boring machines, with horizontal boring mills as alternates. The drilling and tapping operation described above is done exclusively on the automatic machine.

The first set-up on a vertical turret lathe permits facing a 7-13/32″ flange which will be used in registering or locating the work in jigs and fixtures for following operations.

Remaining jobs consist of boring, rough and finish, on horizontal boring mills, drilling, reaming, chamfering, and tapping on radial drill presses.

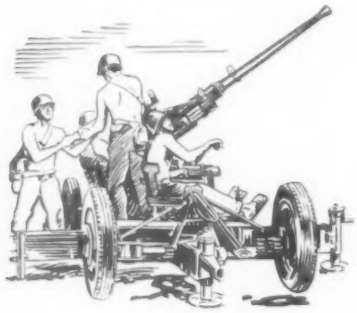
IN PART, the operations required to produce the worm shaft for the elevating gear mechanism illustrate the types of jobbing work to which several lines of machines in the Firestone gun mount plant are devoted.

In the first operation, the forged blank is straddle-milled to length, plus 1/16″. Both ends are then centered in a centering machine using a ⅛″ combination center drill. Five operations on automatic lathes consist of rough- and finish-turning the bearing surfaces, and turning and facing the thread blank. The ½″ pitch thread is rough-milled with a special cutter.

The feather edge produced from this preliminary threading operation is milled off, and then the centers are lapped, preparatory to cylindrical grinding operations. Cylindrical grinding finishes the shaft ends in which splines will be cut and the outer diameter of the worm. Six diameters, ranging from .625″ to 2.720″ are ground.

Two bench lathe operations face the shoulders between shaft diameter and journal bearing surfaces. Next, .749″ splines are hobbed in each end, using spline mills. Centers are lapped before the worm thread is finished on a thread grinder. The thread is ground to a plus or minus

tolerance of .0002" on the pitch diameter and allowing a variation of 15 minutes on the helix.



ASSEMBLY

SMOOTH, ORDERLY PROCEDURE, precisely timed and staged, is essential to the manufacture of rubber products. It is not surprising, therefore, to find that the Firestone Company has instituted a well-balanced sequence of operations for sub- and final assemblies of the Bofors anti-aircraft gun.

Almost 1500 component units are assembled and inspected in the production of a gun in working order. Many of these components consists of pre-assembled units, fabricated by a sub-contractor. For example, the breech, including firing mechanism, is counted as a single assembly unit.

WORK-HOLDING JIGS have aided materially in reducing the man-hour requirements in the assembly bays. Typical is the fixture for loading springs in cylinders for the elevating equilabrator that counter-balances the breech and gun barrel. Three heavy springs are loaded in line into each of two parallel 5" metal tubes. Separator rings, between springs, and holding nuts over the spring shafts, are required to complete the assembly.

The compressing fixture is comprised basically of a horizontal jack or spring compressor, cradles into which the cylinders fit—one on each side of a threaded shaft—and a backstop to support the cylinders against loading action. The compressor consists of two cups secured to an internally threaded member, which is advanced and withdrawn by the revolution of the threaded shaft.

Springs and separator rings are loaded into the cylinders, and the cups fitted over the ends of the coils which protrude from each cylinder. The threaded shaft is turned by electric motor to compress the springs. Shafts are inserted through holes in the cups, and retainer nuts are tightened down by a power wrench which swings from a central position at the end of the fixture so as to be in line with either of the parallel cylinders.

FOR ASSEMBLING the electric brake unit, a "merry-go-round" was built to enable women to do the complete job. The fixture consists of holding jigs on heavy bases which slide around an oval track. Three women can assemble the brake mechanism, complete except for the drum. Before installation of the "merry-go-round," men assembled the unit, working on a flat table.

Assembly operations consist of mounting the plate, complete with lined shoes, in the vertical holding jig. The spindle is inserted, bolts are slipped in to hold the parts together, a catch is tripped and the jig swung downward 90°, which permits running nuts on the bolts, and tightening with a ratchet wrench. The jig is returned to a vertical position and pushed around the track. Two girls divide this assembly operation.

At the third station, band adjustment is checked by means of a dummy brake which provides a means of checking clearance. The assembly is removed from the jig and slid across a waist high ramp to a table for insertion in the drum.

The top carriage is a highly important sub-assembly, since it carries motors, elevating and traversing gear trains, the main external ring gear, equilabrator springs, firing platform, remote control switches, and almost every other operating mechanism with the exception of that installed in the breech.

OBVIOUSLY, such a complicated sub-assembly is itself composed of numerous units which are not only sub-assemblies to this operation, but may include still smaller assemblies.

The elevating gear train is an excellent example. Into the long, tube-shaped, cast casing, is inserted a worm shaft, which activates a worm wheel centrally housed and delivers the power output to an integral pinion and shaft. This partial assembly is performed at stations along parallel rails, between which the casing is suspended and moved. The incomplete unit is set up in a "run-in" machine, where it is run for 30 minutes.

Mounted on face plates of a modified trunnion fixture, the casing can be swung 360°. Bevel gears are added at each end, one for manual activation, the other powered by motor. An adapter is mounted above the manually operated bevel gear, so that the crank can be disengaged when the motor is in use. The adaptor is a sub-assembly to the gear mechanism, brought up to this station from the assembly area adjacent to that in which the gear casing was first set up and made entirely by women.

FOLLOWING GOVERNMENT INSPECTION, the assembled gear train is grease-packed, and the cover plates tightened. The assembly is then ready for mounting on the top carriage.

When the two breech trunnion bearings have been mounted on the top carriage, they are checked for level in relation to the traverse bearing. The carriage is revolved on the main ring gear bearing, so that the bearings pass beneath two dial indicators, set in a plane parallel to the plate on which the main bearing is located. Alignment to level is made by adjustment of shimming beneath the trunnion bearings. A good job here has resulted in lowering the amount of adjustment on the finished gun at sight alignment from 75 per cent to two per cent.

Assembly of the firing platform on the top carriage is progressive, with the carriages mounted on dollies which are moved on a track from station to station.

THE END

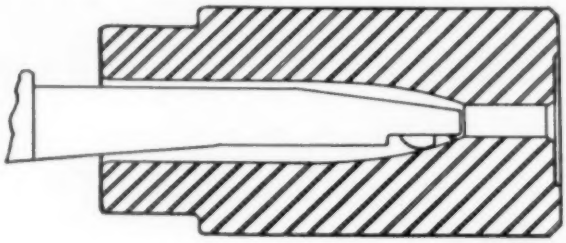


FIGURE 1.

In this simplified drawing of tracer, snout is fully inserted in a 30-caliber shell die.

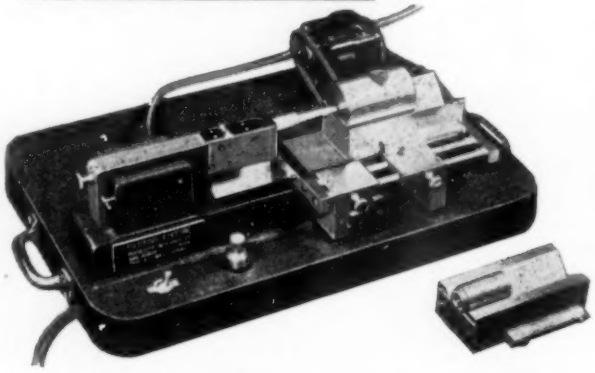


FIGURE 2.

Piloting fixture. Die fits on special V-block, and moves to and from the tracer, which is held in a stationary position.

Physicists' Research photo

Measuring Roughness in Small Cavities

HAROLD LAYTON CASTO

WAR HAS CREATED a tremendous demand for cartridge case and bullet jacket dies. A substantial increase in the useful life of these dies is of great importance, since they represent precious manufacturing skill and an appreciable investment in die steel.

Experience shows that good surface finish in the die cavity produces consistently longer-lived dies. Because of high pressures encountered in the cold extrusion and drawing of metal, small scratches and irregularities not removed in final polishing operations gradually increase in size. This proceeds rapidly to the ultimate fracture of the die, a serious fault in sequence operations.

PRACTICAL INSTRUMENT

Recently, Physicists Research Company undertook measurement of the cavity finish in a group of dies. Made in a variety of shapes and calibers, they represented the most difficult features of surface-roughness measurement. Extensive investigation was necessary to produce a practical device.

Figure 1 shows a tracer with the snout fully inserted into a typical 30-caliber die. Axial measurement of the surface required that the tracer enter to a depth of 1.3″. Some 50-caliber dies required an insertion of 2.6″. An unusual snout shape was required to permit full travel up the profile while retaining maximum snout thickness. Consequently, the snout of the tracer had to be of small cross section and somewhat flexible.

Since many dies measured 3 microinches or less, deflections arising from mechanical vibration of the tracing mechanism influenced the reading and had to be held to extremely low limits. This was accomplished by careful design of the snout and accurate machining of the tracing stroke mechanism.

Operation depends on the relative motion of two spherical contacts, of greatly different radii, traversing the surface measured. A profilometer recognizes this relative motion and indicates its magnitude electronically. The large contact, or skid, is polished tungsten-carbide with a spherical radius of 3/32″, or larger, and is fastened to and supports the tracer body. The small contact, a diamond with a radius of .0005″, terminates the "beam" or moving element inside the tracer. The diamond, being of the smallest practical radius, bottoms irregularities of the surface, while the large skid essentially bridges all roughness of the cartridge surface.

Many of the profile dies terminated in a point, and measurement clear to the point was obviously impossible. A close approach to this ideal limited the radius of the single skid located immediately behind the diamond, requiring a compromise between measurement of the larger irregularities and the depth of measurement in pointed dies. Accordingly, a skid radius of .025″ was selected to permit insertion to a die diameter of .1″ at the skid position.

Figure 2 shows the tracer which is actuated by a relatively vibration-free experimental setup, permitting the first measurements of uncut cartridge dies to be taken.

POSITIONING PROBLEMS

It soon became apparent that manual positioning of the tracer and adjustment of the stroke for each die was slow, fatiguing, and conducive to tracer damage in the hands of unskilled operators. With the tracer inserted in the die, vision was obscured and proper contact of the tracer with the surface was hard to maintain. Several different shapes of dies had to be measured in mixed order, necessitating continual readjustment. Grooves, holes, and shoulders were hazards requiring careful stroke control to avoid diamond breakage.

PILOTING FIXTURE DESIGNED

These factors led to the design of a piloting fixture which automatically aligns the tracer and selects the proper length and position of stroke for the die being measured. This is accomplished through use of easily-interchanged die-holding V-blocks for each type of die. The proper selection of these blocks is the operator's only responsibility. A starting button starts the tracing cycle, which consists of one stroke in and a return stroke, stopping the tracer in the extreme withdrawn position for safe removal of the die. Controls are also provided for constant reciprocation of the die as well as for manual adjustment of the stroke length and motion.

Used in connection with a standard surface roughness recording instrument, this device produces cavity roughness measurements directly in microinches. Its speed and simplicity have justified its use in production inspection where close control of the product is most effective.

"V-DAY TOOLING"

How production techniques have matched fabricating requirements for war material was dramatically described in five technical sessions at the 1944 annual meeting of The American Society of Tool Engineers. Significant papers from those sessions are presented here. Commencing on page 102 is a review by the Bramson staff of the A. S. T. E. conclave.

STREAMLINED to meet wartime conditions and crowded into two days, the technical sessions of the 12th annual A. S. T. E. meeting in Philadelphia, March 26-28 inclusive, revealed recent outstanding developments in metal cutting and mass manufacturing.

Beginning the technical program was a discussion of "Engineering, Planning, Production and Inspection of an Intricate Aircraft Mechanism," presented by a panel of five engineers from the National Cash Register Company. Described in these talks was the complete job of tool engineering from blueprint to final inspection on a job which, because of censorship, cannot be named in print.

Mass production applications for honing tools—large and small—were presented in a slide lecture and in a talk by representatives of the Micromatic Hone Corporation and Sunnen Products Company.

Engineers from Westinghouse Electric & Manufacturing Company, Norton Company, and Sundstrand Machine Tool Company presented up-to-the-minute information on use of electronic controls for machine tools.

In a session devoted to "Metal Removal," new techniques in fly-cut milling and war-born innovations in broaching were discussed by representatives from Weddell Tools, Incorporated, and the American Broach and Machine Company.

Especially newsworthy among the dozen speakers at the technical symposiums was William Jack, whose revolutionary methods have made his company, Jack & Heintz *(see THE TOOL ENGINEER, September, 1943)*, an enigma among American mass manufacturers. Highlights from Bill Jack's talk are reported in the convention news summary, page 102.

Featured in this issue are three technical papers from these sessions:

Fly-cut milling beginning on this page: and recent honing developments on page 90.

MILLING WITH FLY CUTTERS

Are fly cutters a compromise with present-day equipment? An expert reveals the relation of number of teeth in the cutter to the work, the fixture and available horsepower

RALPH R. WEDDELL
WEDDELL TOOLS, INCORPORATED

FLY CUTTERS are probably the original milling cutters. From bygone days many tool engineers can remember seeing some surfacing operation performed by a single tool sweeping in and out of the cut, finishing a surface by the most simple means available. The simplicity of being able to rig a single tool in a holder and of making it revolve will appeal to mechanics forevermore. Their use in the past, however, has been confined to jobs where the amount of work was not large enough to consider the use of a multi-blade milling cutter.

Now, the increasing use of carbide tools has brought back the simple fly cutter, and current practice is revealing the potentialities of milling with carbide. Higher and higher speeds, particularly as used for milling with steel, are at last revealing to tool engineers the limitations of multi-blade cutters for this type of work.

There is nothing the matter with a closely spaced cutter, presuming the cutter blades are strong enough, and there is adequate chip clearance. But, the practical question remains as to whether the work or fixture will stand the immense pressure from the many teeth removing metal. More important, is the machine powerful enough

One horsepower is required to remove

1/2	cubic	inch	of	mild steel	per minute
1	"	"	"	cast iron	" "
1/3	"	"	"	alloy steel	" "
3	"	"	"	aluminum or copper	" "

OR

2 hp to remove 1 cu. in. of mild steel per minute

1 hp to remove 1 cu. in. of cast iron per minute

3 hp to remove 1 cu. in. of alloy steel per minute

1/3 hp to remove 1 cu. in. of aluminum or copper per minute

FIGURE 1. Approximate cubic inches of metal removed per one horsepower applied.

DUTY	MAX. DEPTH	CHIP PER TOOTH
Medium	1/4	.005" to .010"
Heavy	1/2	.008" to .012"
Extra Heavy	3/4	.012" to .020"

FIGURE 2. Chip loads which may be taken with various types of milling cutters.

to drive the many bladed cutter, particularly with the higher cutting speeds permissible with carbide?

The compromise with existing equipment has been to reduce the number of blades in the cutter. And fly cutters are the simplest of all in this respect. They are simple to make and easy to maintain. Furthermore, they offer simple operating characteristics which were apparent even when they were made of high speed steel.

One of the most difficult things to obtain in a milling cutter is to swing a true revolution on the face. Cutters may be ground and mounted ever so carefully but often, only one blade is actually doing the finish facing. This is particularly true of large diameter cutters. Under examination, the teeth in large cutters may indicate true when in a static position, but when they revolve a different condition evidently prevails. In one case, a 24" cutter on a single spindle was replaced with three 9" cutters on three interlocked spindles. A better finish was produced.

And so today, in line with present day operating conditions, fly cutters have been revived, some with a single tooth, some with two blades, and some with more. The present design of fly cutters perhaps has best been exemplified in the past in woodworking tools. The inserted blade knife heads that are used in joiners and shapers are but forerunners of the fly cutters today. They are similar in mechanical design and practicability. In fact, it is interesting to note that some of the builders of high speed metal working milling machines are wood working tool builders.

HORSEPOWER FIRST CONSIDERATION

What to use and how to use it involves thoughts of the work, material, fixture, possible cut and power available. In application, the first consideration is the horsepower required to machine various materials, considering the cubic inches of metal removed per horsepower. Rule of thumb conservative statistics are shown in Figure 1.

Under certain operating conditions, these figures may vary, but they are approximate enough for consideration of power for milling. They are quite applicable to problems of milling with carbide. Cutter angles for carbide cutters are generally less sharp than with other cutters. This gives the stronger cutting edge which is so desirable with carbide, particularly when negative angles are employed in milling steel. Hence, carbide is generally considered less efficient with respect to power.

Next, for consideration, is the chip per tooth which may be taken with various size blades. For duty cutters taking varying depths of cut, the approximate chip loads may be itemized as in Figure 2.

A fair chip load is proposed for each tooth which is cutting because this gives most efficient metal cutting. This merely confirms some of the original experiments of Taylor who found that greatest efficiency was with heavier cuts.

PROPER CUTTING SPEEDS

Suggested cutting speeds are specified by many machine and tool makers. Figure 3 offers general specifications.

The speeds in Figure 3 are only offered as suggestions to determine approximate production. The finish desired, the condition of the material, the section or part being milled, the rigidity of the fixture or the machine, and the power available are practical considerations which affect the ultimate performance.

Selecting some of these figures, one can determine how they work out in practice with the cutting materials and machine tools at hand.

One project might be machining a mild steel surface 2" wide on which a depth of 1/8" has been allowed for finishing. If the available milling machine has a 5 hp motor, all of the power is probably not available at the spindle. Presuming 80 per cent efficiency, the power available is 4 hp which indicates that 2 cubic inches can be removed per minute. The area of cut is 1/8 or 2 or 1/4" square inch. The rate of feed, taking a cut of 1/4" area and removing 2 cubic inches is 8 inches a minute. Now, presume that the cutter is 4" diameter which gives a good coverage of 50 per cent of the surface machined. For cutting soft steel with carbide, a cutting speed of about 500 feet per minute on the 4" cutter, operating at about 500 rpm is required.

SIMPLE FORMULAS OFFERED

If a conventional carbide-tipped face mill with 8 blades (some have more) is used, there would be 4000 teeth in the cut per minute. At an 8" feed this gives a chip load of .002" per tooth, which is rather light. If instead a 2 bladed fly cutter is used, the chip load would be 4 times as great or .008", which will give greater metal cutting efficiency.

The simple formulas shown in Figure 4 may be simply worked out for various jobs to determine the practical feed, practical chip load, and

FIGURE 3. General cutting speeds for various types of cutters and materials.

CUTTING SPEEDS

MATERIAL IN CUTTER	MEDIUM OR SOFT CAST IRON	MILD STEEL MAL. IRON BRASS	ALLOY STEEL HARD C.I. STEEL CAST	ALUMINUM OR COPPER
HSS	60	90	45	750
SUPER HSS	75	XX	60	1000
CAST ALLOYS	100	200	90	XX
CARBIDE	200	300	150	1500
		800	250	or more

1. Cubic in. per minute = Horsepower available / (2 for mild steel, 1 for C. I., 3 for alloy steel)

OR Horsepower available x 3 for aluminum or copper

2. Feed in in. per minute = Cubic inches per minute / depth and width of cut

3. RPM (approx.) = Diameter x suitable cutting speed* / 4

*(See Table 3).

4. Chip load = Feed / No. of blades in cutter x RPM

OR No. of blades in cutter = Feed / Chip load x RPM

(See Table 2).

Left: FIGURE 4.
Formulas for determining feed, chip load, and cutting speed, as related to available horsepower.

MATERIAL	HSS	CAST ALLOYS	CARBIDE
Soft Steel	15°	10°	—6°
Alloy Steel	10°	7°	—4°
Cast Iron	10°	7°	7°
Brass	0°	0°	0°
Aluminum or Copper	25°	20°	20°
Magnesium	30°	30°	30°

Above: FIGURE 5.
Suggested rake and shear angles for fly cutters of various types, as related to materials.

practical cutting speed to use, considering the available power.

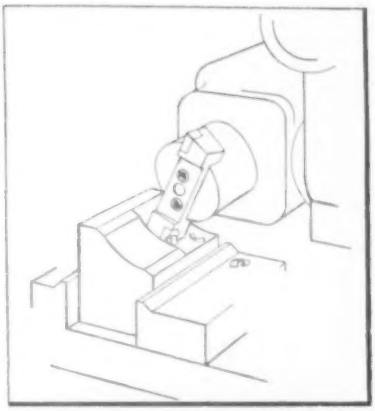
Careful analysis of cutting problems will show that most present day equipment is lacking in power to take efficient advantage of the use of carbides, and that the best compromise of the current conditions is generally to use carbide fly cutters with one or two blades. No doubt machine tool designers are well aware of the conditions, and are taking steps to remedy same, but with the vast quantity of machines produced for the war effort, some time will pass before present day equipment is supplanted.

The cutting angles used with fly cutters are comparable with other milling cutters, as shown in Figure 5.

Note the negative angles for milling steel. Also the sharp positive angles for aluminum, copper or magnesium.

There are comparatively few commercial designs of fly cutters. Some offer a solid cutter on which the carbide tip is brazed directly. These are of a cast Meehanite section as illustrated in Figure 6, or have been cut from boiler plate. Both offer simplicity and rigidity. However, they must be entirely replaced when worn if the backed up section has been ground away. If it has not, a new tip may be brazed on. This type of cutter, shown in Figure 6, is popular in the aircraft industry, from which this whole technique has evolved.

Inserted blade fly cutters, are of course, the original type. There is considerable controversy as to the comparative merit of the solid versus the inserted. Solid offers the features of simplicity and rigidity. Inserted can also be rigid but in addition offer features of adjustment and renewability. The Kennametal fly cutter in Figure 7 is a solid simple affair, bolting onto the spindle nose as shown. The fly cutter shown in Figure 8 uses a triangular shaped tool



Kennametal drawing

FIGURE 7.
Solid fly cutter which bolts onto the spindle nose as shown.

Weddell Tools drawing

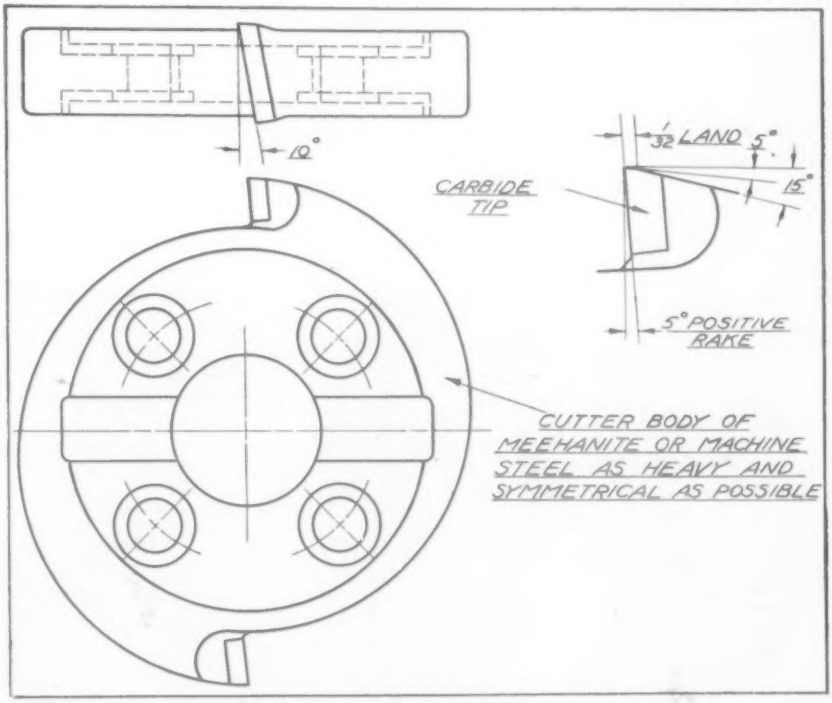
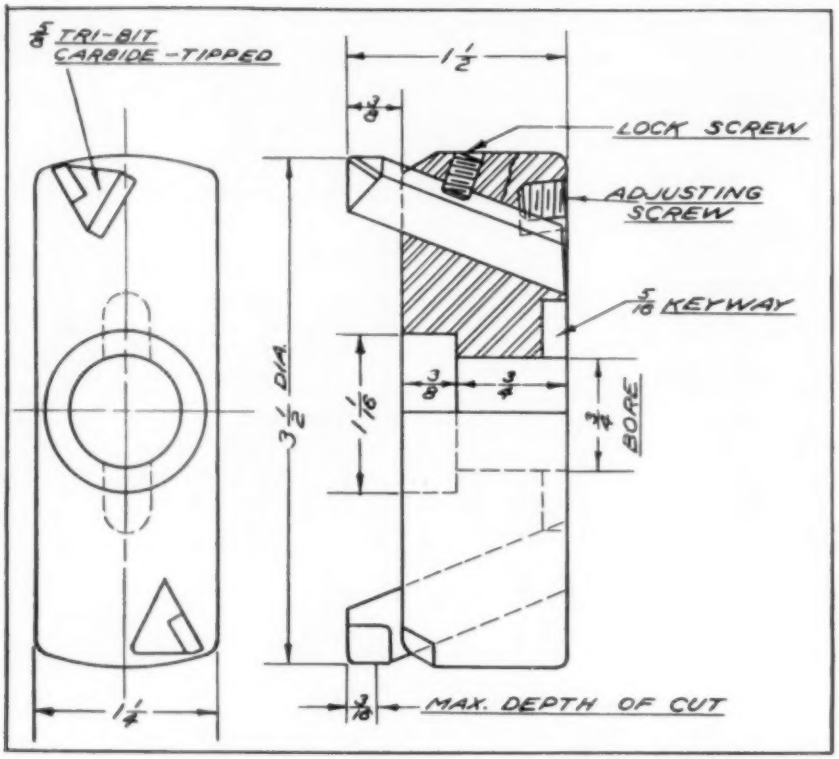


FIGURE 6. Typical solid fly cutter.



Weddell Tools drawings and photos

FIGURE 8.

Fly cutter with triangular-shaped tool bit to receive inserted blade.

bit, locked in a V-shaped hole and adjustable by simple back-up screw which engages a niche in the bit.

Fly cutters may be made of the shell type as shown in Figure 9, or they may be made with shank, Figure 10. The shell type in larger sizes can be made to bolt directly on the spindle nose. Figure 11 shows that the back of the tool is counterbored and keyed to fit the National Standard Spindle Nose.

The grinds incorporated into fly cutters are similar to those in regular milling cutters. The best clearances, land and chamfer will probably be found to suit the local conditions, starting off with the conventional grind. Sometimes it has proven feasible on two bladed fly cutters to have one blade rough and the other finish.

Figure 12 shows how one blade is ground for roughing to cut on the diameter, while the other blade projects slightly more on the face and is ground with a slight lead thereon. Fly cutters can better perform this dual operation as the roughing blade is out of the cut when the finisher comes in. Not the slightest vibration can be permitted, however, or else the finishing effect will be destroyed.

Fly cutters in operation present considerable opportunity for vibration. The single or double cutter blade bumps in and out of the work, putting some strain on the drive members. In fact, high speed pictures have shown how these cutters sometimes bounce away before ploughing into the cut. The remedy is to use flywheels in the drive. This dampens the vibrations or fluttering caused by the intermittent cutting.

FLYWHEELS INCREASE POWER

Flywheels also increase the effective power available to the cutter, particularly if the cut is comparatively short. The potential energy which is stored in the heavy rim of the wheel increases considerably the force available to go through the cut. Actually, power is stored up and then expended, which of course is the purpose of any flywheel. Flywheels should be as heavy as feasible and mounted as close to the cutter as possible.

A flywheel arbor is shown in Figure 13, which mounts on the spindle of the machine. It has a nose, which is a replica of the standard shell end mill arbor onto which the fly cutter, or more bladed milling cutter, is fastened and driven. This arrangement simply supplants the standard shell end mill arbor. It permits a lighter bodied less expensive and more easily handled milling cutter to be used.

A similar device shown in Figure 14, is known as a flywheel spindle nose adapter, the back of which has a counterbore to fit the spindle nose, while the front is the same as the spindle nose, permitting the mounting of the same cutter as used on the machine spindle nose. A flywheel lengthens the life of the carbide mill-

FIGURE 9. Shell-type fly cutter.

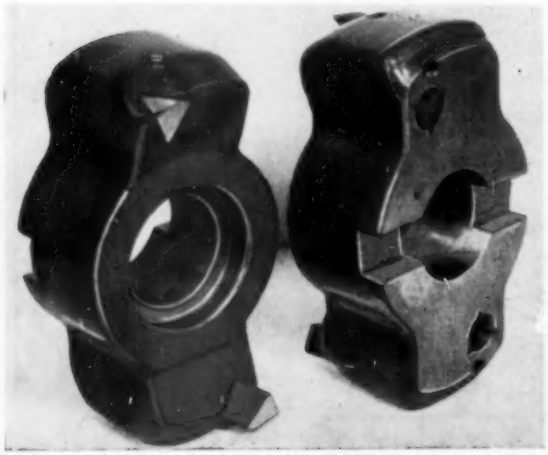
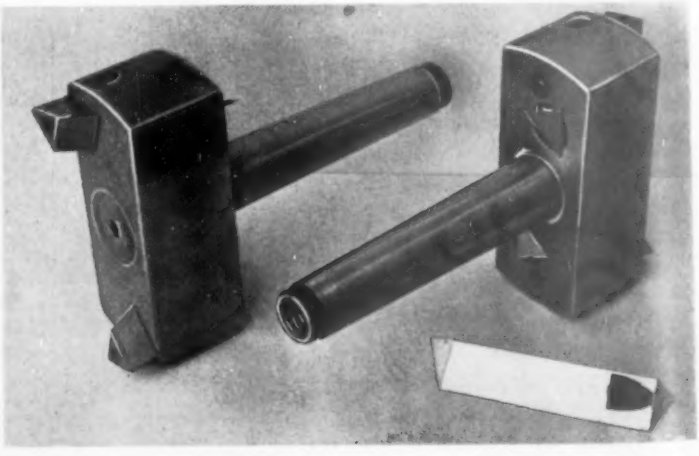


FIGURE 10. Fly cutter with solid shank.



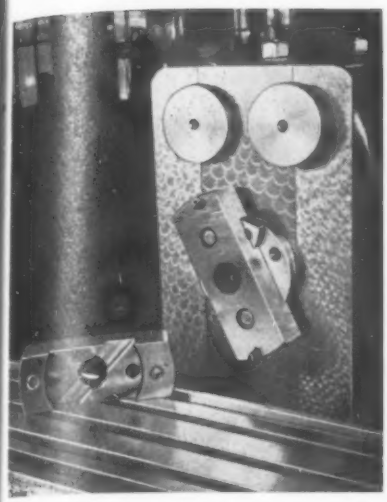


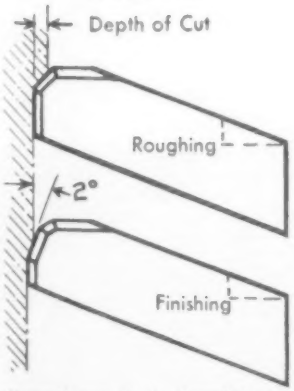
FIGURE 11.
Fly cutter with National Standard Drive.

ing cutter. Newer designs of milling machines may well incorporate this feature. In the meantime, however, placing a flywheel as near the cutter as possible, will improve results.

In operation fly cutters are generally used dry. Their general high speed operation prevents the use of coolants. As fly cutters generally are of the bar type, proximity to their rotation is dangerous. They should be guarded if possible. Likewise high speed carbide cutter operations throw hot chips a considerable distance, hence it will pay to give careful thought to a safety set-up.

THE END

FIGURE 12.



Sometimes it is feasible to design two-bladed fly-cutters —one blade for roughing, one for finishing. Proper lead and projection of finishing cutter are shown.

FIGURE 13: ***above and right.***
Flywheel arbors mount on the spindle of the machine, lengthen the life of carbide cutters.

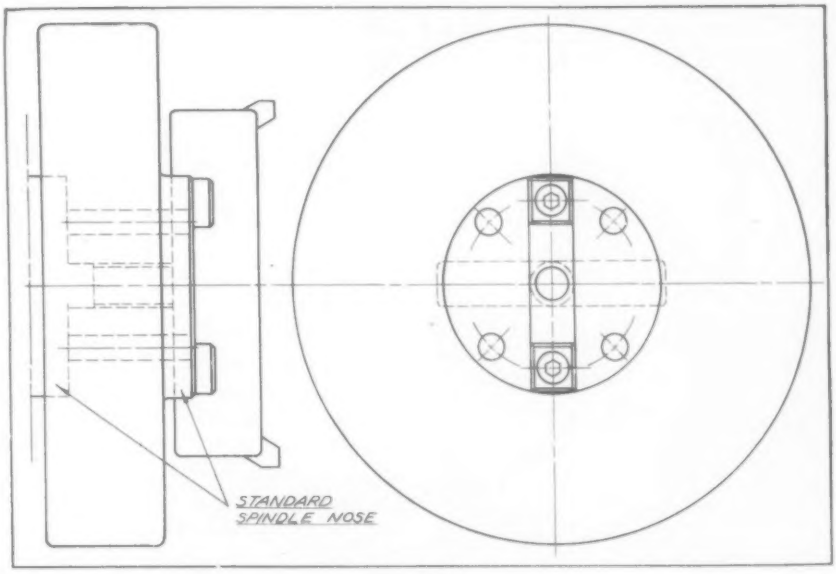


FIGURE 14.
Flywheel adapter permits mounting same cutter as used on the machine spindle nose.

DETERMINING TOOL EFFICIENCY FOR HIGH SPEED MILLING

• Believing that the best way to remove metal is to make as few chips as possible, a production engineer with Consolidated Vultee Aircraft Corporation reveals a simple effective method of measuring loads directly at the cutter — see the May issue of THE TOOL ENGINEER.

This method has been applied to determine tool efficiency for high speed milling of aluminum. Relationships between chip shear and depth of cut are correlated to permit easy comparison of cutter efficiency.

The method established, the article shows how shear load can be related to depth of cut for tools having various side cutting rake angles. This article brings the plain facts of high speed milling into focus.

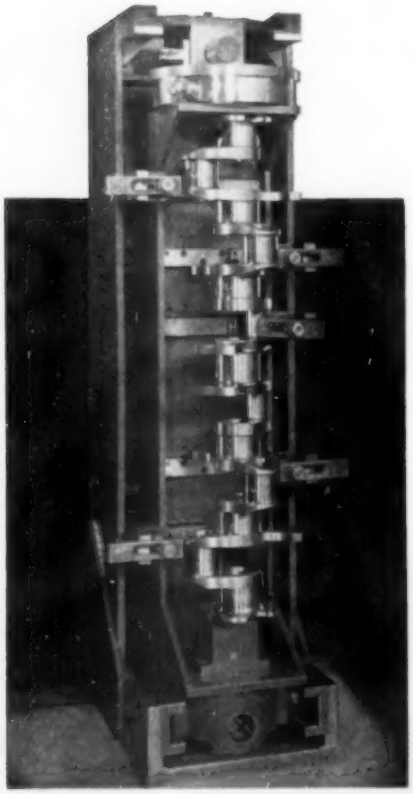
In final sizing and finishing of landing gear oleo cylinders, honing generates a minimum of cutting marks and surface distortions which induce fatigue failure.

Honing for Precision Stock Removal

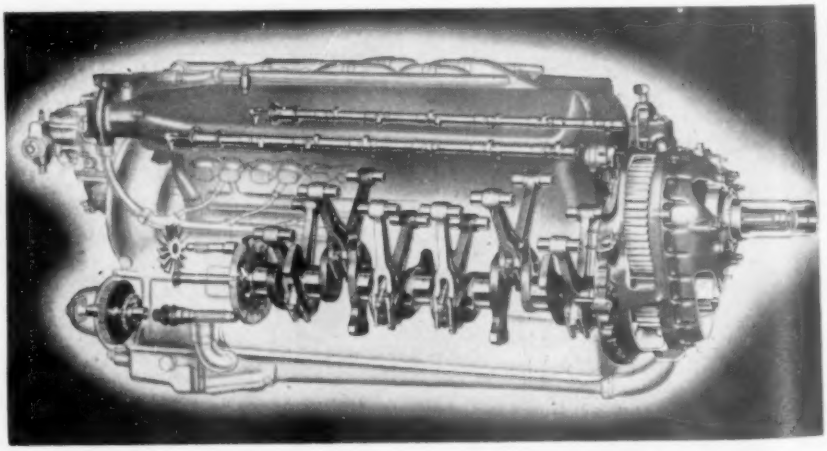
THE increased applicability of honing as a stock removal tool was emphasized by K. W. Connor, president of Micromatic Hone Corporation in a slide lecture presented at one of the technical sessions of the national meetings of the American Society of Tool Engineers.

Selecting weapons and vehicles of the fighting forces as examples of mechanical units which have benefited from honing's advantages, he pointed to a wide range of jobs being honed to produce high dimensional accuracy and fine surface finishes.

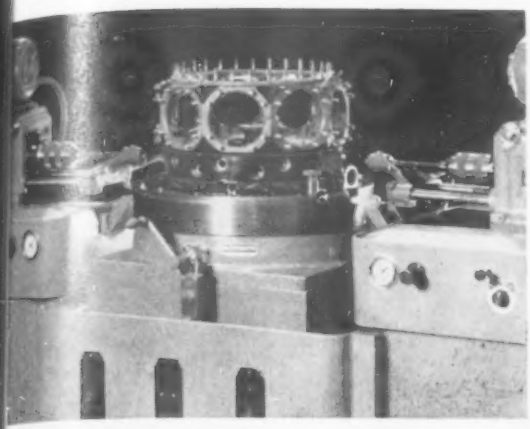
Examples of honing applications to produce parts within precise dimensional limits are shown in aircraft production, where higher operating efficiency has necessitated greater con-



Main bearing and throw pins carry load, require accurate fit and finish.



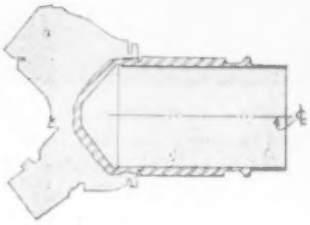
***Right:* Honing boosted production 500 per cent on certain parts used in aircraft engines.**

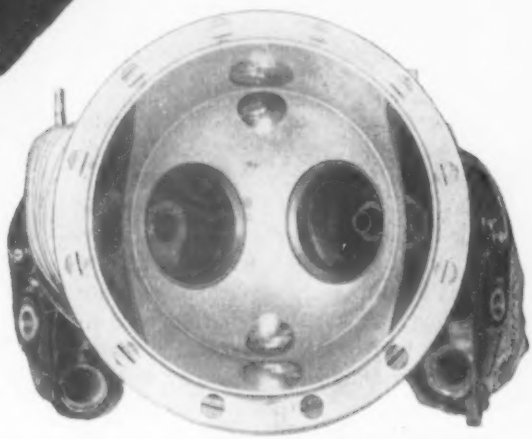


Valve guides are finish-honed in assembly with one complete indexing of fixture. Controls have been developed to cause stones to cut uniformly over slotted end of bores.

●

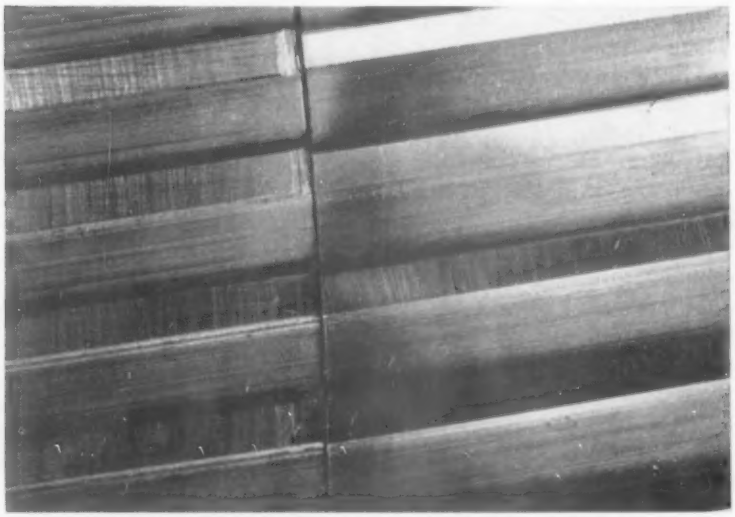
Below:
This tool is used with a 75-foot horizontal honing machine developed to handle 16-inch guns. Similar applications permit tool adjustment in bore by remote control.



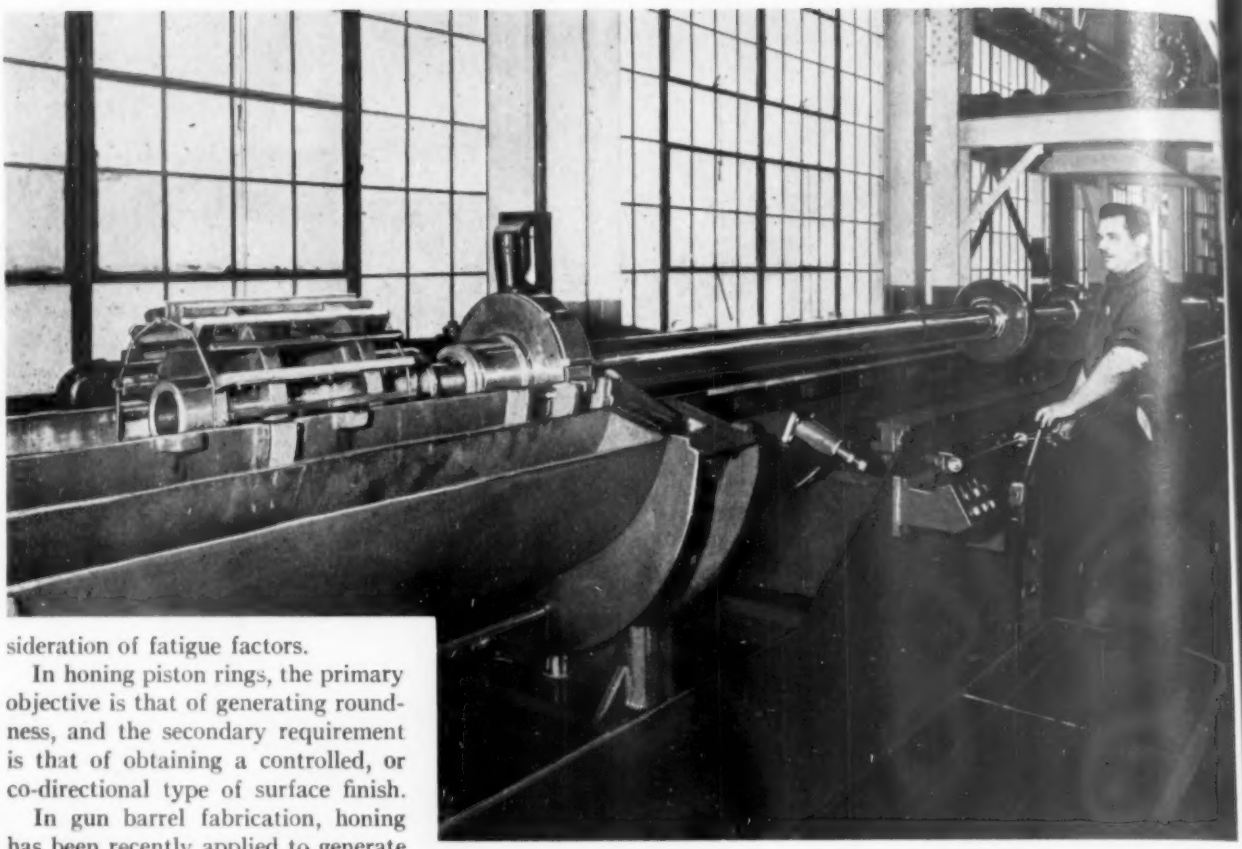


Micromatic Hone Corporation photos

The honing tool has established itself firmly in the manufacturing field as a facility for removing metal as well as for obtaining dimensionally accurate surface finishes. "Green" honing of engine cylinders is one example of its usefulness in removing stock. In one operation, requiring removal of .018" to .025" of metal, production with honing was eight pieces per hour more than was possible with previously used methods.



Right section of picture shows rifling produced by honing in modified 75 mm cannon, compared with that produced by previously used methods (left). External indexing fixture guides internal movement of stones.



Because plane catapults may be called on to withstand pressures as high as 30,000 psi in operation, they must be precision-built to insure stamina. A large honing tool is used to machine the cylinder as shown in the halftone above. The honing process removes .060" of metal. A cradle fixture has been devised to provide support for the large honing tool.

sideration of fatigue factors.

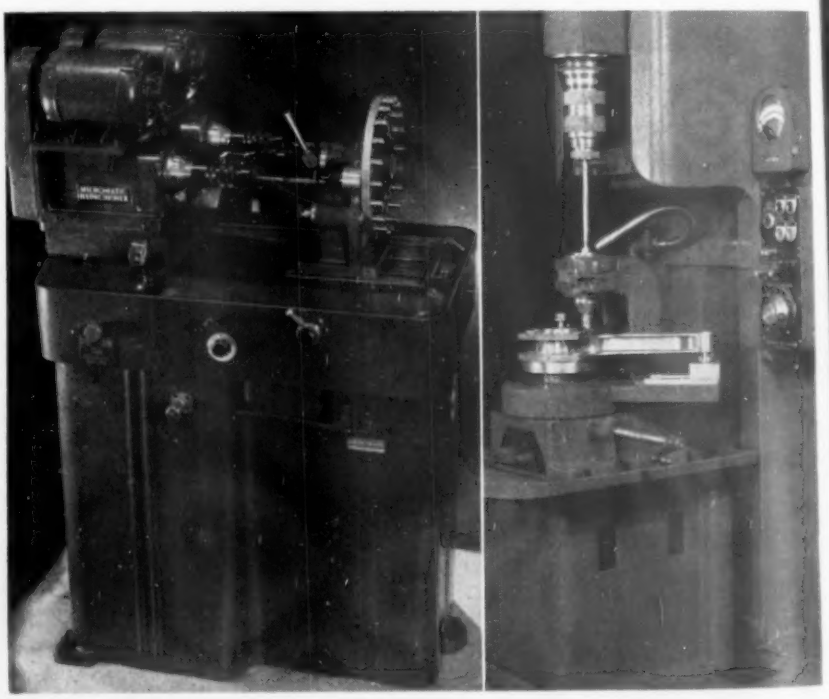
In honing piston rings, the primary objective is that of generating roundness, and the secondary requirement is that of obtaining a controlled, or co-directional type of surface finish.

In gun barrel fabrication, honing has been recently applied to generate rifling. This applies particularly to new, hard steels. This method supplements honing's earlier, as well as present, use in finishing both uniform and accelerated rifling.

In finishing tapered bores, the contraction or expansion of the honing stones with respect to the changing dimension of the part is controlled by a roller following a sine bar. After metal is removed to establish dimensional accuracy, the rotation of the tool is stopped and only the reciprocal action continued to obtain a co-directional, or draw finish.

The future of honing was intimated in present standard and some special applications. Machining extremely hard Diesel fuel injectors to no limits calls for the application of tools as small as ¼". A tool of ⅛" diameter, with complete controls for stone expansion, has been developed.

In honing the same grade of porcelain as that used to dress tungsten carbide tools, some estimate of the hardness of material which can be penetrated accurately is given. But the most advanced applications at present are probably those used to machine parts which attain supersonic speeds in action. Accuracy is measured in 12 to 15 millionths of an inch. THE END



External honing is used on carrier rig for a radial engine (left) to insure fine and accurate finish of the hubs over which gears fit. Picture at right shows set-up evolved for connecting-rod production. Rods are honed before and after plating to establish uniform depth of plating.

High Production Honing Without Fixtures

A. F. HASTY
SUNNEN PRODUCTS COMPANY

HONING is a metal-removal operation which is yet to enjoy widespread utilization in the metal-working trade. The principle of honing is old. It has been long used to sharpen razors and knife blades.

To hone a razor or knife blade, a flat abrasive stone of very fine grain is used. The edge of the razor or knife blade is laid on the stone and stroked in a circular motion. When the stone is held stationary and the part is stroked the shearing action of the stone against the steel edge generates a smooth, true edge.

This, basically, is the type of honing discussed in this article. Instead of treating flat surfaces, however, methods and machines are described for stock removal and finish on inside cylindrical surfaces, by using a fixed hone and stroking the part by hand on diameters from .185″ to 3.500″.

The honing machine used on this type of work consists of a variable speed motor driven chuck with a method of operating the stone expander on the hone. This expander will expand or contract the stone within the range of the hone and will permit adjustment to compensate for stone wear.

THE HONE ITSELF has several parts: the body or mandrel, the wedge or part which expands the stone, and the stone or stones.

A honing stone is bonded to a steel or die cast holder which the expander works against to expand or contract the stone. Stones are held into the body or mandrel by spring pressure or other mechanical means.

Some hones have a single cutting stone with two guide shoes opposite. These guide shoes are placed so that they will not set up a synchronization of chatter against an out-of-round hole. This method will generate a round hole from one out-of-round with the least amount of stock removal.

Then there are hones that use more than two stones equally spaced on the hone diameter. These hones are called positive action hones, and are used for correcting a tapered hole, an out of round hole and to give the desired surface smoothness. Another type hone, the spring loaded stone, is not used for correcting. Used only as a beauty treatment, it follows the original hole. The hone using the staggered three point contact will round a hole quicker and to a limit of .000025,″ while the four or more point hone will not give this accuracy. The hone revolves and the part is stroked or oscillated to give a spiral cutting action. The maximum cutting efficiency is a 45° mark or one stroke equal in length to circumference of the hole being honed, per revolution of hone.

In honing, the full width of the stone is in contact for cutting and in most instances the stone is nearly as long as the part to be honed. To eliminate bell mouth in a part it is necessary that the stroking be over the ends of the stone. If the stone should protrude beyond the ends of the part and only the center of the stone is used, the ends will not wear and a bell mouthed hole will result.

Also, if the stones are shorter than the part and the ends of part are not stroked over the ends of the stone, a barrel type hole will result. Stroking is an important phase of honing. Every honing job is a separate problem according to the length of hole, diameter, desired finish, whether the hone is to remove bowed condition, taper, or out of roundness. Other factors include the type of operation the hone follows, limits of the hole, can the part be reversed on the hone, and what kind of openings break through the honed surface.

● Honing is a machine operation which supplements grinding, boring, reaming and broaching. It is used to generate roundness and to produce surface finishes as fine as one microinch.

Honing small jobs, as discussed in this article, requires no fixtures, is simple to perform, and makes possible the salvaging of substantial quantities of precision parts ordinarily scrapped.

The maximum length of a hole that can be honed depends on what is required. To take all the bow condition from the hole requires a hone with stones as long as the part. If a piston fits into a cylinder the hone should be at least twice as long as the piston to eliminate any bind. The bowed condition will still prevail, but the length of the hole will make no difference.

Hones are being used to machine parts straight within .0002″ that are 18″ long and 1.5″ diameter. On smaller diameters, for example, .187″, the maximum length now is 3″ for practical purposes, as the hone body or mandrel is too small to take the torque.

WHAT FINISH can be obtained by honing? Surface finish has always been more or less of a joke in manufacturing. The engineering department would specify, "Grind Smooth" or "Ream Smooth". The question has always been, "How smooth is smooth?" A perfectly smooth hole is a hole with no tool marks of any kind. It is a base metal finish checking 0 microinches on a surface analyzer. A hone will produce a finish of 1 microinch and up. A good commercial grind will check about 12 to 14 microinches.

Honing a part to a 1 to 2 microinch finish is being done on ring gages. This approaches the perfect bearing surface as near as is possible with the types of bonded abrasives now available. The surface hardness of the part being honed also is a big factor in how low a microfinish can be obtained. For example, a ring gage checking 62-65 Rockwell on the C scale will hone to 1 microinch finish with a 600 grit stone, while the same steel at Rockwell 50 and using the same stone would check 4 to 5 microinches. The explanation is that the stone would take deeper cuts in the softer steel.

A bowed condition due to heat treat is removed by having a hone stone as

long as the part, and can be corrected faster and with less stock removal by honing than by any other process. The hone cuts out the three tight spots at one time.

Honing will take out a taper. A hone is unlike a grinder in that you use a stone from ¾" to as high as 18" in length and internally expand it against the wall of the hole to build up cutting pressure. A tapered hole when put on a hone will, after a few strokes be partially corrected, but because the hone cuts at only one end you will also put a taper on the hone. To correct this, the part is reversed which tends to taper the hone in the opposite direction. By reversing this procedure several times the hone will take out the taper and true itself in the process.

HONING GENERATES a round hole. First, a hone will round a hole because it is internally expanded against the surfaces to be honed and will not pass the narrow diameter without cutting out metal, gradually increasing the narrow diameter until it blends with wider diameter. The wide diameter will be increased in this process, as the stones will take out metal when the deep penetration of the stone releases from the narrow sides and cuts slightly on the wide side. The metal removal ratio with a 3 point hone on an out-of-round hole is approximately 3 to 1. With a four or more point hone, it is 5 to 3.

In some parts that are heat treated the hole would be satisfactory if it hadn't shrunk or become bowed. Honing will solve this problem fast and efficiently. This is what is called partial honing—honing for size from a broached, reamed, bored, ground or heat treated part.

NO ATTEMPT IS MADE to obtain a 100 per cent bearing. Partial honing can be used in production, salvage departments, and in tool rooms. Five minutes are required to set up a hone or to change the hone from honing one to another diameter, as hones are adjustable for range. From partial honing with a coarse stone or cutting stone to complete honing for a fine finish is only a matter of additional honing to finish, removing the tool marks, and changing the stone to give desired surface smoothness.

Honing will allow you to hold limits of .000025". Of course, the closer a limit is held the more time it takes for the operation from a production standpoint. It is, however, much easier to hold a .0005" limit on a hone than on a grinder because if the part is honed .0001" or .0002" undersize it can be put back on the hone and additional stock removed.

The hone centers itself in the part. Honing two holes for alignment can be accomplished by using a tandem hone. This will bring holes into line with the least amount of stock removal.

PROBLEMS AND REQUIREMENTS

HOLES OR OPENINGS through a honed surface present a problem. The stone must be either longer or wider than any hole or slot in a part. You must have sufficient overhang of the stone to prevent it from dropping in a hole.

A keyway in a part doesn't prevent honing if the stone is sufficiently wider than the keyway to overlap it. To hone a part with holes breaking into the honed surface it is necessary to have a hone that will not give, such as a spring loaded hone. As the area to be honed is reduced at the openings, the hone will open up and take more stock in depth because of the stone pressure being exerted against this smaller area. This produces a slightly out of round hole. The same condition exists in grinding. You can hone these parts by using a solid adjustment on the hone and light cutting pressure when removing the last few tenths.

Honing on aircraft parts has become a must. In this field it is used to eliminate fatigue cracks, lighten construction, increase horsepower per pound of motor, reduce size of parts, increase bearing surfaces, and to make easier assembly and interchangeability of parts. It also eliminates wear due to roughness of hole and amorphous metal.

Honing can be used on practically everything that is made from metal, increasing wear life and maintaining size and clearances. It will salvage parts generally scrapped. It saves hand scrapping, and lapping, and is used in tool rooms on drill jig bushings, dowel pin holes, and similar jobs.

Abrasives used in honing are in stick form and vary in length and width according to the size of hole to be honed. They also vary in grain size and hardness of bond. The more stone area in contact, the softer the bond must be. Less stone area, requires a harder stone bond. A coarse grit stone with a hard bond can be used to remove tool marks. After the tool marks have been removed it is necessary to use a finer grain with a softer bond. The reason for this change is that a coarse, hard stone is dependent upon the surface roughness to break it down and keep the grain sharp for cutting. After roughness has been removed from the part it is then necessary to have a softer bond that will allow the finer grain to pull out when it becomes dull.

The smaller the diameter to be honed the finer the grain must be for fast cutting. Also, because of the small stone area, the bond must be harder. In view of these facts, stones will vary in grain size and hardness of bond for different diameters. A stone, as it becomes finer for a given area, will have to be softer in bond. Fine grit polishing stones should not be used to remove over .0005" of stock, as their cutting action is slow. Neither should a roughing stone be used after the tool marks are removed. For cutting stock a medium grit stone works best.

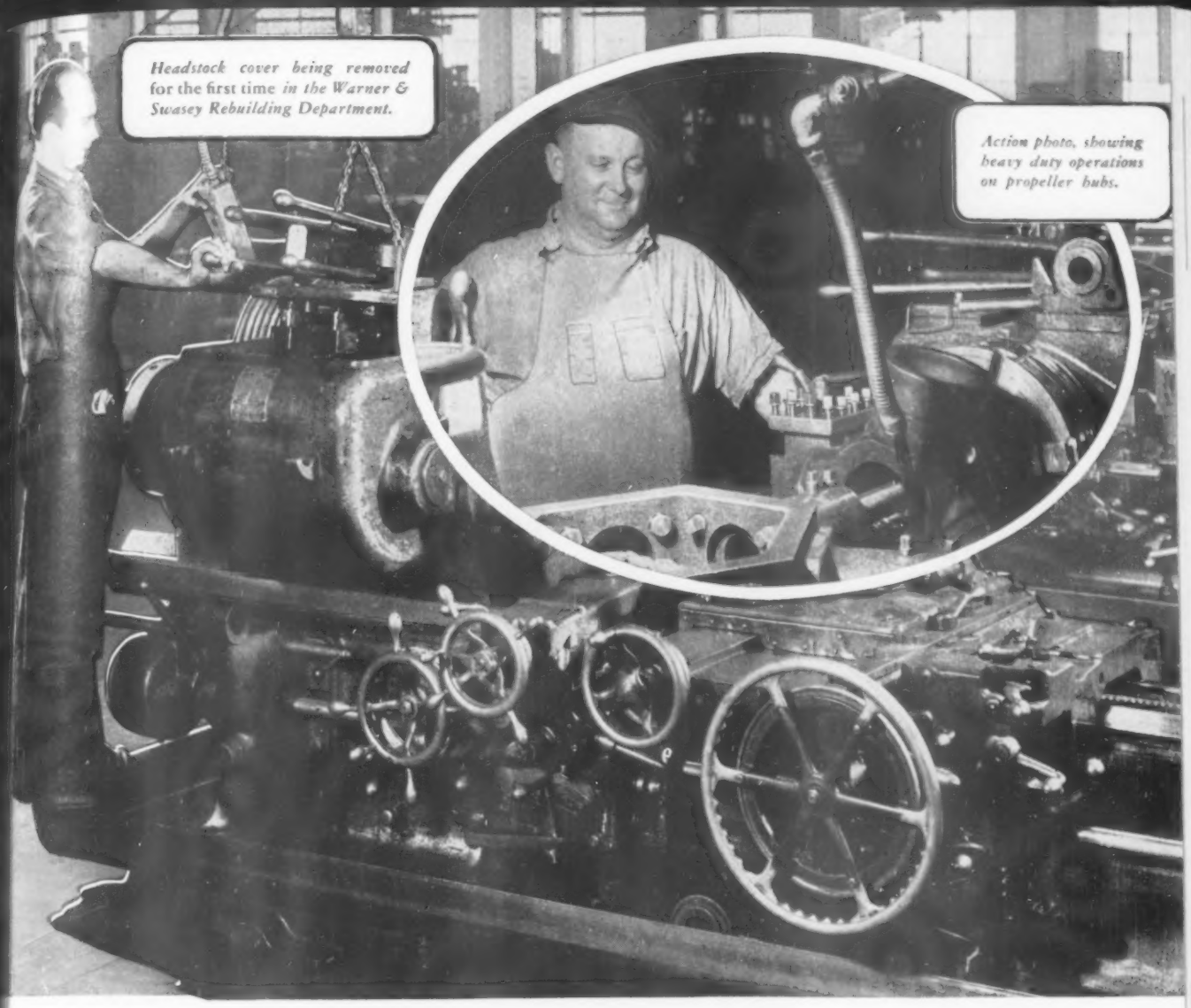
Honing can be used to good advantage when a reamer or broach is cutting undersize or the tolerance is too close for a reamer or broach, when a little more bearing area is required from a bored hole, for removing scale and distortion caused by heat treatment, and for improving ground finish and sizing after grinding.

BEFORE THIS WAR, honing was little used. It now has come into its own because of the requirements for closer fits, interchangeability of parts and the desire for smooth finishes.

For example, honing is used to obtain straight, smooth, round holes necessary in leak-proof hydraulic valve bodies on aircraft and ordnance equipment. In peacetime, hydraulic valves for commercial aircraft, and control valves for hydraulic dump bodies and road graders will be honed.

Header dies for heading bolts and rivets are being honed today, giving five to seven times the header die life obtained by methods previously used. Honing enables manufacturers to hold body diameter of bolts and rivets to closer tolerance. In peacetime, this will make for better products with less clearance between the bolt or rivet and the parts being held.

. THE END


Headstock cover being removed for the first time in the Warner & Swasey Rebuilding Department.
Action photo, showing heavy duty operations on propeller hubs.

How's this for a Service Record?

GOOD CARE PAYS DIVIDENDS

THIS Warner & Swasey 4A Turret Lathe, shown above, has had 25 years of service, crowded into a span of fourteen years.

Since it went into service for the Steel Products Engineering Company, Springfield, Ohio, early in 1930, it has been operating on *two continuous* 10-hour shifts—equivalent to 25 years' normal service. The work done involved heavy roughing cuts and finishing operations on aeroplane propeller hubs requiring an extremely heavy fixture. Surface polishing operations were performed at maximum spindle speeds.

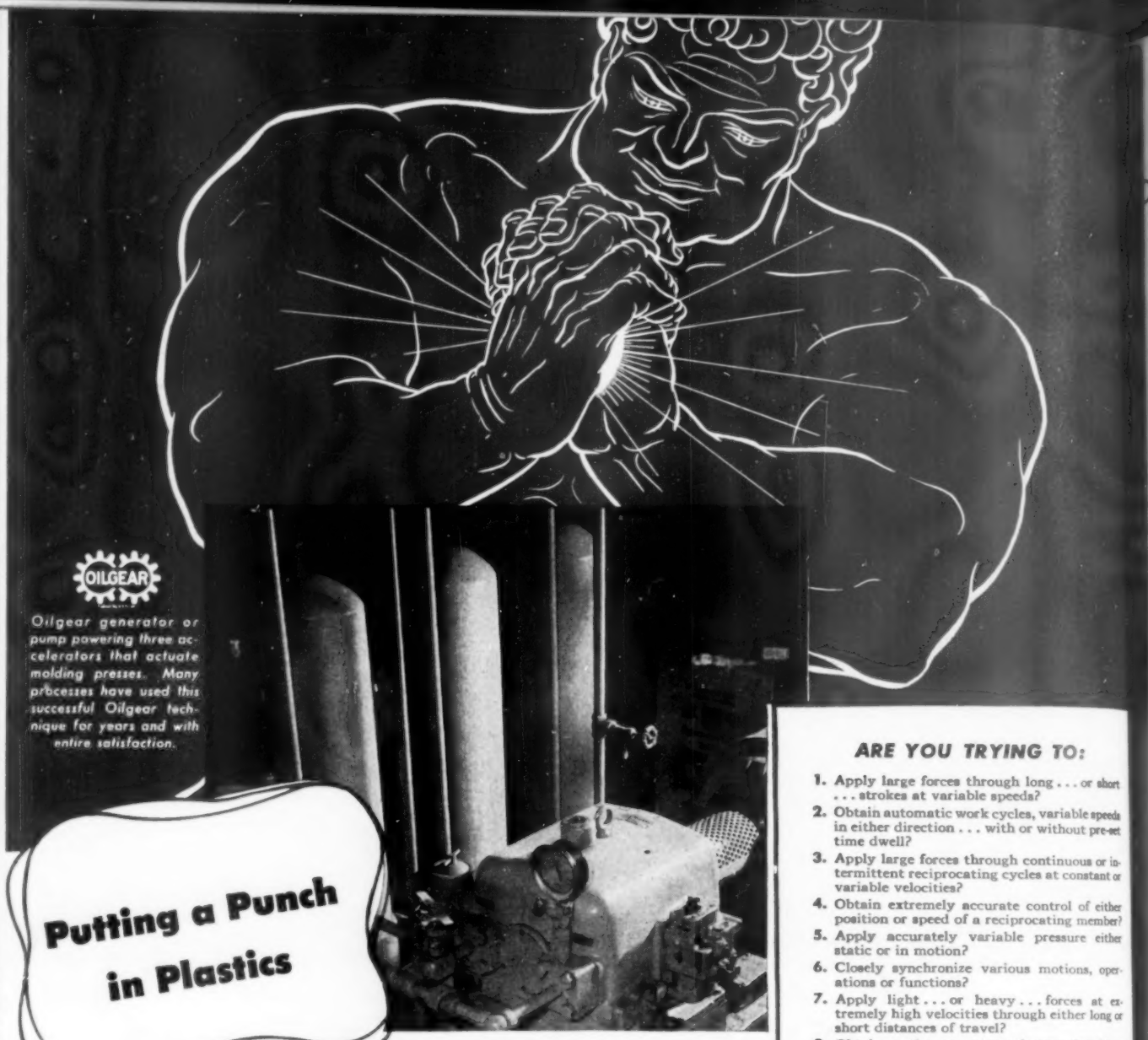
During the fourteen years of continuous heavy duty service, the Steel Products Engineering Company maintained a policy of providing proper lubrication and correct adjustment on a regular schedule.

Until this 4A machine was returned to Warner & Swasey for inspection and rebuilding, the headstock cover had never been removed. Torn down in the rebuilding department of Warner & Swasey, internal parts were found to be in remarkably good condition, considering the long, hard service they had undergone.

Now we are rebuilding this turret lathe, getting it ready for another long life of productive usefulness. Its record is a tribute to the craftsmanship of the Warner & Swasey men who built it originally, and to the operators who gave this machine the proper care that good mechanics give good tools.

WARNER & SWASEY
Turret Lathes
Cleveland

YOU CAN TURN IT BETTER, FASTER FOR LESS . . WITH A WARNER & SWASEY



OILGEAR

Oilgear generator or pump powering three accelerators that actuate molding presses. Many processes have used this successful Oilgear technique for years and with entire satisfaction.

Putting a Punch in Plastics

Oilgear Made Idle Seconds Do the Work of Dollars

If the new machine or process you are developing has idle moments in its recurrent work cycle, take a tip from Phoenix. The Phoenix Metal Cap Company of Chicago operates a battery of plastic molding presses. These presses require no power at all during the charging periods, so Oilgear engineers saw a way to reduce costs. Instead of the big drive that would normally be required, they installed one small, highly efficient Oilgear Fluid Power generator . . . and for each press, a single air-accelerator. The Oilgear system works while the presses rest . . . *building up in the accelerators the tremendous power required for the molding operation*. The saving in initial drive investment was immense, power consumption was reduced.

This is just another highlight in the story of Oilgear versatility which with Oilgear engineering experience is solving problems up and down the land—machine design puzzles solved by means of the tremendous force in small space . . . the force without motion . . . the steplessly variable speeds . . . the combination of linear and rotary motion . . . or any of the other functions Oilgear provides. Oilgear may be a "natural" for you. Why don't you find out? Now is the time. . . . THE OILGEAR COMPANY, 1308 West Br[illegible] Street, Milwaukee 4, Wisconsin.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R. P. M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

OILGEAR

Fluid Power

PRODUCTION DATA SHEET

PIN METHOD OF MEASURING ANGULAR SIDED SPLINES

C. D. WRIGHT
Chief Tool Engineer

A. R. GOATLEY
Tool Engineer

McKINNON INDUSTRIES, LIMITED • SUBSIDIARY OF GENERAL MOTORS

● THE PIN METHOD of measuring tooth thickness of gears may be applied to angular sided splines by the same method and with the same advantages. Measuring over the top of rolls placed between the teeth gives a measurement independent of the outside diameter of the spline, and does not require any special measuring instrument.

By the use of the following formulas, it is not necessary to use pins of special diameter that contact the pitch line of the spline, but pins of any convenient diameter may be used. Calculation for measurement over the pins is as follows:

Where:

N = Number of splines
a = Pitch radius
T = Chordal tooth thickness at pitch radius
z = Included angle of sides of spline
Mc = Dimension to center of pin
Me = Dimension over pins, where N is even
Mo = Dimension over pins, where N is odd
G = Diameter of pin

From Diagram 1

(1) $Mc = OH + AH$

(2) in triangle OBF, $\sin s = \frac{T}{2a}$

thus

$s = \sin^{-1} \frac{T}{2a}$

(3) since $x + s = \frac{180°}{N}$

therefore $x = \frac{180°}{N} - \sin^{-1} \frac{T}{2a}$

(4) in triangle OHK,

$x + s + \frac{z}{2} + r = 180°$

therefore $r = 180° - \frac{180°}{N} - \frac{z}{2}$

and in triangle OHF

$t = 180° - x - r$

(5) from steps 3 and 4

$t = \sin^{-1} \frac{T}{2a} + \frac{z}{2}$

(6) in triangle AFH

$y = 180° - r$

or

$y = \frac{180°}{N} + \frac{z}{2}$

(*concluded on following page*)

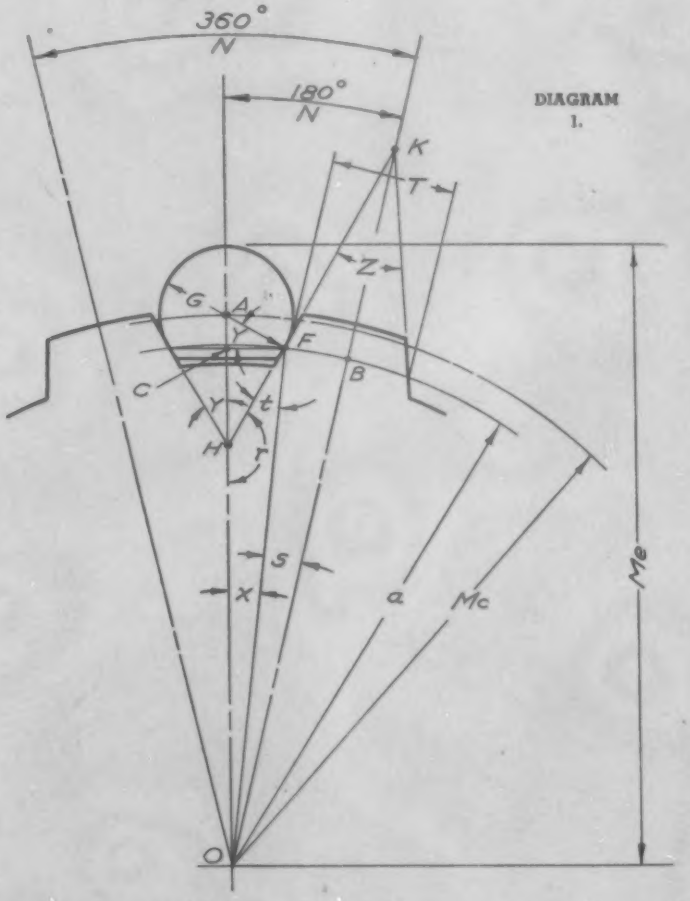
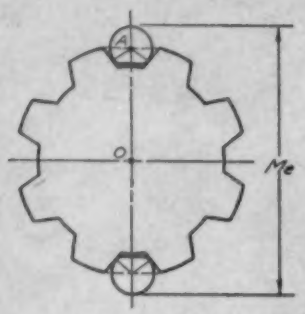
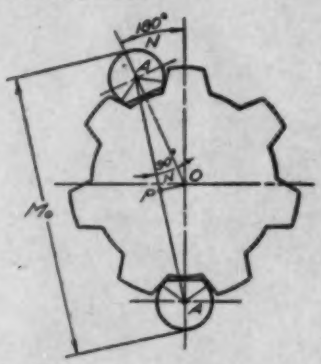


DIAGRAM 1.

NOTE: This is the thirtieth of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.



Left: DIAGRAM 2.



Right: DIAGRAM 3.

(7) in triangle OHF

$$OH = \frac{a \sin t}{\sin r}$$

from steps 4 and 5

$$OH = \frac{a \sin \left(\sin^{-1} \frac{T}{2a} + \frac{z}{2}\right)}{\sin \left(\frac{180^\circ}{N} + \frac{z}{2}\right)}$$

(8) in triangle AHF

$$AH = \frac{G}{2 \sin \left(\frac{180^\circ}{N} + \frac{z}{2}\right)}$$

(9) placing (7) and (8) in (1), we obtain

$$Mc = \frac{a \sin \left(\sin^{-1} \frac{T}{2a} + \frac{z}{2}\right) + \frac{G}{2}}{\sin \left(\frac{180^\circ}{N} + \frac{z}{2}\right)}$$

(10) In Diagram 2
since $Me = 2\,Mc + G$
therefore

$$Me = \frac{2a \sin \left(\sin^{-1} \frac{T}{2a} + \frac{z}{2}\right) + G}{\sin \left(\frac{180^\circ}{N} + \frac{z}{2}\right)} + G$$

giving the dimension over pins of diameter G, where the number of splines is an even number.

To find the dimension over pins of diameter G for an odd number of splines:
In Diagram 3

(11) $AP = Mc \cos \frac{90^\circ}{N}$

since

$$Mo = 2Mc \cos \frac{90^\circ}{N} + G$$

therefore

$$Mo = \frac{2a \sin \left(\sin^{-1} \frac{T}{2a} + \frac{z}{2}\right) + G}{\sin \left(\frac{180^\circ}{N} + \frac{z}{2}\right)} \cdot \cos \frac{90^\circ}{N} + G$$

(12) To find the diameter of a pin contacting the pitch line of the spline in triangles AFC, AFH

$$\text{angle AFC} = y = \frac{180^\circ}{N} + \frac{z}{2}$$

(from step 6)

in triangle OCF
$CF = a \sin x$

(13) in triangle AFC
$AF = a \sin x \sec y$
and
$G = 2a \sin x \sec y$
or

$$G = 2a \sin \left(\frac{180^\circ}{N} - \sin^{-1} \frac{T}{2a}\right) \sec \left(\frac{180^\circ}{N} + \frac{z}{2}\right)$$

From (13) a convenient size pin may be selected for substituting in (10) and (11), since the formulas are not restricted to the use of pins contacting on the pitch line.

Example

Where:

$N = 16$
$2a = 1.643$
$T = 0.171$
$z = 29^\circ$

From (13)

$$G = 2a \sin \left(\frac{180^\circ}{N} - \sin^{-1} \frac{T}{2a}\right) \sec \left(\frac{180^\circ}{N} + \frac{z}{2}\right)$$

$$= 1.643 \sin \left(\frac{180^\circ}{16} - \sin^{-1} \frac{0.171}{1.643}\right) \sec \left(\frac{180^\circ}{16} + \frac{29^\circ}{2}\right)$$

$$= 1.643 \sin (11.25^\circ - 5.97^\circ) \sec 25.75^\circ$$

$$= 0.1678$$

Use 5/32 (0.15625) pin (nearest available size)

To find dimension over pins, using 5/32 diameter pins:
since N is even, use equation (10)

$$Me = \frac{2a \sin \left(\sin^{-1} \frac{T}{2a} + \frac{z}{2}\right) + G}{\sin \left(\frac{180^\circ}{N} + \frac{z}{2}\right)} + G$$

$$= \frac{1.643 \sin (5.97^\circ + 14.5^\circ) + 0.15625}{\sin 25.75^\circ} + 0.15625$$

$$= \frac{0.73082}{0.43444} + 0.15625$$

$$= 1.8385$$

If N is odd, use equation (11)

THE CRIB

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

IDEAS · KINKS · SHORT CUTS

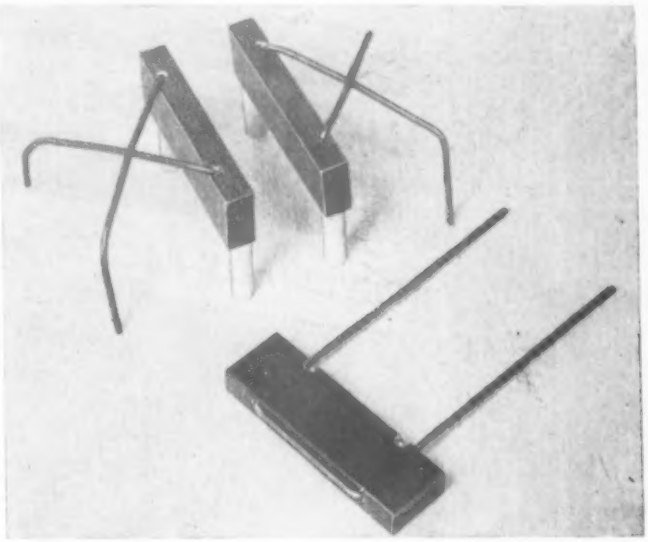
Plastic Replaces Facing on Vise Jaws

USED AS A SUBSTITUTE for strategic metals in a set of vise jaws, Textolite has been found by one tool engineer to be superior to the metal replaced.

Among the advantages found with the use of this material are a higher coefficient of friction and considerably greater protection to finished surfaces than was obtained with other types of vise jaws.

To make the jaws, two pieces of the plastic, measuring ½" by 1-¼" by 4" are used. Two ⅛" holes are drilled 2½" apart along the narrow edge of the piece to accommodate a rod of ⅛" soft-iron wire about 15½" long. An angular groove ⅛" deep, cut between the two holes, provides a recess to make the wire flush with the top of the jaw.

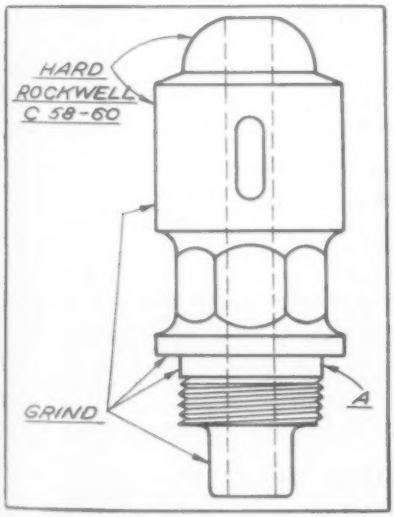
In the photograph, the jaw is shown with the wire inserted before bending, and with the wire bent to a U-shape to fit the holes, and finally as bent diagonally to fit the jaws of the vise. Here is a simple kink for saving surfaces.



High-Frequency Hardening

HIGH-FREQUENCY HEATING has been used by a tool engineer to obtain hardness and toughness in the machine part shown in the adjacent drawing. The part is subject to heavy strain and hard wear.

Because of its function, the part



must be tough in one place and hard in another. Steels that would withstand the strain did not have the required hardness.

Toughness was obtained by heating the parts to 1525-50° F., quenching in oil, and placing in a salt bath at 800°F. for three hours. This gave the strength required but the parts still were soft.

Then by placing the coils of the high-frequency machine over the places where hardness was desired, and heating to 1500°F., followed by oil quenching, and drawing for one hour at 450°F., proper hardness was obtained at the points of wear.

Help for Loading Heavy Stock in Automatic Screw Machines

REPLACING the cylindrical rollers on outboard stock supports used on automatic screw machines with a pair of balls makes end movement easier during stock loading of the machine.

The ball unit has one large ball nested in small balls, the group being placed in a retaining case. This is a stock item for handling steel plates.

• Have you ever made notes on some of your "know-how" items—or perhaps drawn sketches on a paper napkin only to throw or give them away?

When you have an idea, short cut or kink, send it to THE TOOL ENGINEER. You will receive five dollars for each one of yours that is published. This is something to do while waiting for the soup to come, and it more than pays for the meal.

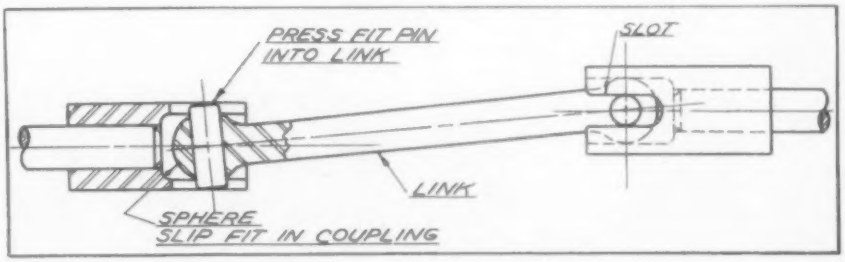
Send your time-and-material savers to The Bramson Publishing Company, 2842 W. Grand Blvd., Detroit 2, Mich.

Ball-and-Socket Coupling for Driving Light Loads

FREQUENTLY, production engineers experience difficulty in obtaining ball-and-socket couplings which will function a reasonable length of time without breakdown.

The coupling shown in the sketch below has proved efficient for driving light loads at speeds up to approximately 7500 revolutions per minute.

It is adaptable for polishing inside diameters, where a planetary action is required, and where the two shafts are in parallel. The maximum angle of the line should not exceed 15°. The coupling should be well lubricated for most efficient operation.



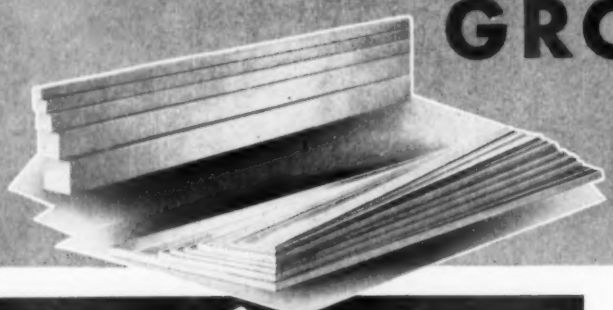
STARRETT GROUND FLAT STOCK

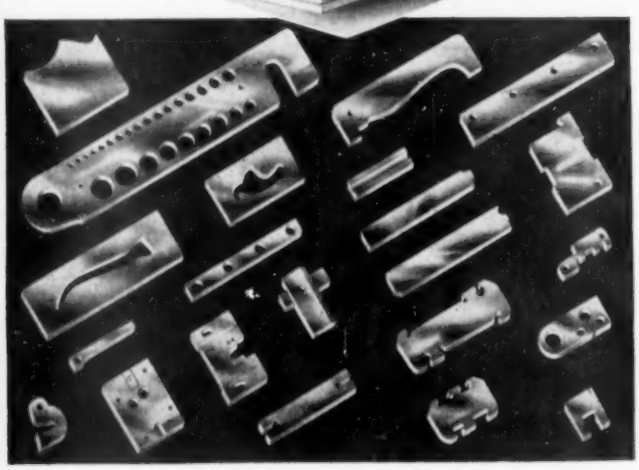
ACCURATE TO A THOUSANDTH

HIGH GRADE, ANNEALED TOOL STEEL

INDIVIDUALLY PACKED, WITH DIMENSIONS CLEARLY MARKED

STARRETT GROUND FLAT STOCK





It comes in a variety of widths, 18 inches long, thicknesses by sixty-fourths to an inch or more.

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Apprentice Training Pays Dividends

Tool Design Supervisor R. Kolb at Caterpillar makes suggestions to an apprentice tool designer in the company's forward-looking training program

Caterpillar Tractor photos

E. M. BERTSCHI
TRAINING SUPERVISOR
CATERPILLAR TRACTOR COMPANY

TRAINING today is a definite part of our industrial system, and training methods have been developed in step with industrial progress. Many production engineers attribute their success to training they received years ago, plus the valuable experience they have been able to obtain since that time. However, for several years the opportunity to acquire a skill through an organized training program existed on only a relatively small scale.

The Caterpillar Tractor Company has long recognized the value of training and the responsibility of developing men as well as designing and building machines. One of the predecessor companies of Caterpillar established apprentice training in 1918. Since then the company has expanded its training program to include many phases of manufacturing and technical processes.

One of the courses offered at "Caterpillar" is the four-year machinist apprentice course, which includes training in both shopwork and classwork. Many of the company's tool engineers are graduates of this course. In the shop, the apprentice receives training on all standard production machines, performing all operations on actual production parts. The last two years of the course are spent in the tool room where experience both in machine work and bench work is received. Some apprentices receive training in tool design and production planning.

While apprentices are acquiring shop skills they attend classes three hours each week as part of their regular work. Subjects included in the schedule are directly related to the work in the shop. Classroom instructors are men with years of shop experience.

Caterpillar Tractor Company production planning class of four-year machinist apprentices discussing the processing and tooling of a sheet-metal part. Instructor R. L. Sutton is explaining the principles of a blanking die.

The subjects taught in the first two years are: Blueprint reading, preliminary mathematics, shop practices, screw threads, power transmission, industrial physics, engineering drawing, and trigonometry. During the last two years, while the apprentice is receiving training in the tool room, classroom subjects are: Metallurgy and heat treatment, production planning, tool design, gearing, and industrial economics.

The objective of the metallurgy and heat treatment course is to give the student an understanding of the physical and chemical properties of iron, steel and common non-ferrous metals. Subjects included are the history and composition of iron and steel, the methods and effect of heat treatment, alloying elements and alloys and impurities. The effect of composition and heat treatment on the machinability of the metal received prime consideration.

Classwork is supplemented by motion pictures and slides and by trips to the metallurgical laboratory, heat treatment department, and foundry.

Production planning is a condensation of "Process Engineering" as applied directly to the Caterpillar although it applies generally to any ma-

(Concluded on page 111)

"V- Day Tooling" Is Theme of A. S. T. E. Annual Meeting

Philadelphia scene of Tool Engineers' Twelfth Annual Meeting. Tooling, machine controls, and new cutting techniques featured in five technical sessions at three-day streamlined conference.

PHILADELPHIA—Without benefit of an equipment exhibition which usually boosts attendance at such events, the 12th Annual Meeting of the American Society of Tool Engineers was concluded March 28 with the announcement that a total of 956 war-busy production men registered for the three-day, streamlined conclave.

This record attendance, Society officers pointed out, was largely attributable to interest in the five technical sessions presented during the three-day meeting held in the Quaker City's Bellevue-Stratford Hotel.

Jam-packed into the last two days of the convention were talks presented by 13 outstanding authorities from American industry speaking on new methods in tool engineering, metal cutting, fabricating and production management. Highlights of these technical sessions are presented later in this article.

ELECTION OF OFFICERS

Climax of the Tool Engineers' Annual Meeting was the election of Douglas D. Burnside as new President of the Society. Burnside, who has a long record of outstanding work in the technical organization, is Superintendent of the Quick Meal Stove Company, Division, American Stove Company, St. Louis.

C. V. Briner, Manager, Small Tool and Gage Division, Pipe Machinery Company, Cleveland, was named First Vice-President; and A. M. Sargent, President, Pioneer Engineering and Manufacturing, Detroit, was elected Second Vice-President.

In a reorganization and expansion of the Society's Executive Committee structure, the addition of two new National Offices was approved by the Board of Directors. W. B. Peirce, Works Manager, Flannery Bolt Company, was elected to the new office of Third Vice-President. Named to fill the new position of Assistant Secretary-Treasurer was Len G. Singer, District Manager, Williams & Wilson, Limited, Toronto, Canada.

Earl V. Johnson, Dayton, Ohio, Carbide Tool Engineer, Firth-Sterling Steel Company, was re-elected National Secretary; and Floyd W. Eaton, Personnel Manager, Crawford Door Company, Detroit, was again named National Treasurer.

Although the convention formally convened Sunday, March 26, Tool Engineers from as far as Seattle, Los Angeles, and San Diego began to gather in Philadelphia the preceding day for business meetings.

Stiff bidding between chapters for 1944-45 convention sites was climaxed at the Board of Directors Meeting Sunday when Syracuse won the privilege of staging the Semi-Annual Meeting next October, and Cleveland was selected for the Annual Meeting in March, 1945. The selection of Cleveland, with its vast Public Auditorium equipped for the display of machine tool equipment, was believed significant in view of an earlier announcement by the Society that plans are being made for holding "the largest exhibition in the history of production equipment, tools and machines, approximately 90 days after the end of the war in Europe."

Approved at the business sessions of the Twelfth Annual Meeting was a reorganization of the Society's Western Regions 18 and 19, the establishment of a new Canadian Region, and the addition of another member to the Board of Directors.

NEW ALIGNMENT OF CHAPTERS

Explaining the changes in the Society's structure, Adrian Potter, National Executive Secretary, said, "As a result of the growth of the Society, a new alignment of chapters within regions on the West Coast and in Canada has been approved.

"Consequently, at the October Semi-Annual National Meeting," he continued, "one more Director from Canada will be added to the Board."

Explaining the revised Chapter set-up in the Society, Potter said, Golden Gate Chapter at San Francisco will now go into Region 18, along with the other two California chapters, San Diego and Los Angeles. A new Director will be elected from Los Angeles, to attend the fall National Meeting in Syracuse.

At the same time, he said, Portland Chapter goes into Region 19 along with Seattle. The new Director from this region will be elected from the latter Chapter.

A new Region, Number 21, will be established in Canada, comprising Toronto and Montreal, with a Director to

(Continued on page 104)

NEWLY-ELECTED NATIONAL OFFICERS FOR 1944-45 TERM

Formal induction ceremonies for new National Officers at the Annual Banquet, Philadelphia. Pictured *(left to right)* are: Douglas D. Burnside, President; C. V. Briner, First Vice-President; and A. M. Sargent, Second Vice-President.

Two of the remaining three men pictured were elected to newly-created National Offices. W. B. Peirce, Third Vice-President; Floyd W. Eaton, re-elected Treasurer; and Len G. Singer, from Toronto, new Assistant Secretary and Treasurer.

***Inset* is the re-elected National Secretary, Earl V. Johnson, who was called from the convention before induction ceremonies by the death of his father.**

Convention photos by
The Bramson Publishing Company

Years of on-the-job milling experience make these the *exceptional* cutters you've been looking for!

For years Plan-O-Mill engineers and master mechanics worked with milling cutters—as users, as well as manufacturers. Problems of threading and forming a wide variety of "difficult" jobs had to be solved. In solving them some very definite conclusions on the improvement of both thread and form milling cutters were arrived at. These have been embodied in the exceptional tools now offered by Plan-O-Mill.

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THREAD AND FORM PLAN-CO MILLING CUTTERS

Elected President of the American Society of Tool Engineers at the Society's 12th annual meeting, Philadelphia, was Douglas D. Burnside of St. Louis.

Burnside, who has a long record of A.S.T.E. organization work, is superintendent of the Quick Meal Stove Company Division, American Stove Company.

A. S. T. E. CONVENTION REPORT

be elected from the latter chapter this year. Canadian Region 20 will now be comprised of Chapters in Windsor and Hamilton. A new Director will be elected from Hamilton. The chartering of still another A.S.T.E. Canadian Chapter, at St. Catherines, Ontario, Potter said, is imminent. This chapter would be added to region 20.

Potter explained the addition of two new officers to the Society's Executive Board saying that a Third Vice-President was added to enable speedier handling of the mounting work last year shouldered by five National Officers, as well as provide greater opportunity within the Executive Board for the development of presidential candidates.

The naming of Len G. Singer, from Toronto, as Assistant Secretary-Treasurer, he said, was not intended to establish a precedent for providing approximately 1,000 Canadian members representation among the National Officers. Though they deserve such representation and undoubtedly will continue to have it, he said, the office was created and Singer selected to fill it at this time chiefly to facilitate the handling of the Society's Canadian funds and records, as well as maintain necessary contacts with Canadian government officials.

Seven new National Officers elected to 1944-45 terms were formally inducted into office in ceremonies held at the Annual Membership Meeting and Banquet staged in the Bellevue-Stratford Ballroom in the evening, March 28.

Attended by 1,250 members and guests, Society officials announced that from the attendance standpoint the Banquet was the most successful in the 12 year history of the A.S.T.E.

A promise that the tool engineers would lead United States and Canada in reconversion to peacetime manufacture as they did in conversion to war production was made at the Banquet by Ray H. Morris, Vice-President, Hardinge Brothers, Incorporated, and retiring A.S.T.E. President.

"We are going to do the job of reconversion," he promised, and stated that "there are no boundaries for the work of the Society." Even before war ends, probably before the end of the year, Morris said, a chapter of tool engineers will be chartered in Mexico City.

As Banquet speaker, John H. Van Deventer, President and Editor, The Iron Age, delivered a word-picture of the work and responsibilities of "The Tool Engineer in the Post-War World."

"If I were to suggest a slogan for your Society," Van Deventer said in describing the organization as perhaps the most rapidly growing of all technical groups, "I would inscribe upon your banner the three letter word 'How'. It will, undoubtedly, be the most important word in our post-war technological and economic lexicon.

TOOL ENGINEER OF TOMORROW

"The tool engineer of tomorrow," he told the gathering, "is not necessarily going to occupy the same orbit and travel the same path as does the tool engineer of today.

"Some people say that the tool engineer is the result of the mass-production age. I don't think so. I would say that he is the cause of it," Van Deventer added. Saying that he thought the tool engineers had been tagged to their disadvantage, he said, "I believe that the tool engineer has as large or even larger part to play in this coming post-war world of ours than your engineering brethren in other categories."

Emphasizing the need for conservation of raw materials, for cutting fewer chips rather than more chips, the trade journal editor told the tool engineers, "In the years to come, you gentlemen who possess the 'know-how', must show the world not only how to save minutes but how to save materials.

"Your organization may have begun with a recognition of the importance of tool design as applied to metal cutting operations," he continued, "but it has gone far beyond that. It has developed into an organization representing the

(Continued on page 106)

Below—**Eighteen Directors, along with National Committeemen and Executive Officers, held a day-long business session in the South Garden of Philadelphia's Bellevue-Stratford Hotel. New National Officers, elected by the Directors at this meeting, were formally inducted into office two days later at the Annual Banquet.**

Below—**Detroit, birthplace of the A.S.T.E., sent a large delegation to the Philadelphia meeting. Here is an informal group from the Motor Capital: F. Eaton, O. Winter, G. Whitehouse, B. Carpenter, G. Carpenter, W. Kay, W. McClellan, J. Delaney, C. Miller, C. Hause, J. Allmon, L. Szal. Among other Chapter Number One members who attended the Society's 12th annual conclave were: A. Lehmann, W. Smila, C. Thiede, A. Sargent, newly-elected Second Vice-President, C. Mooney and A. Rylander, Technical Editor.**

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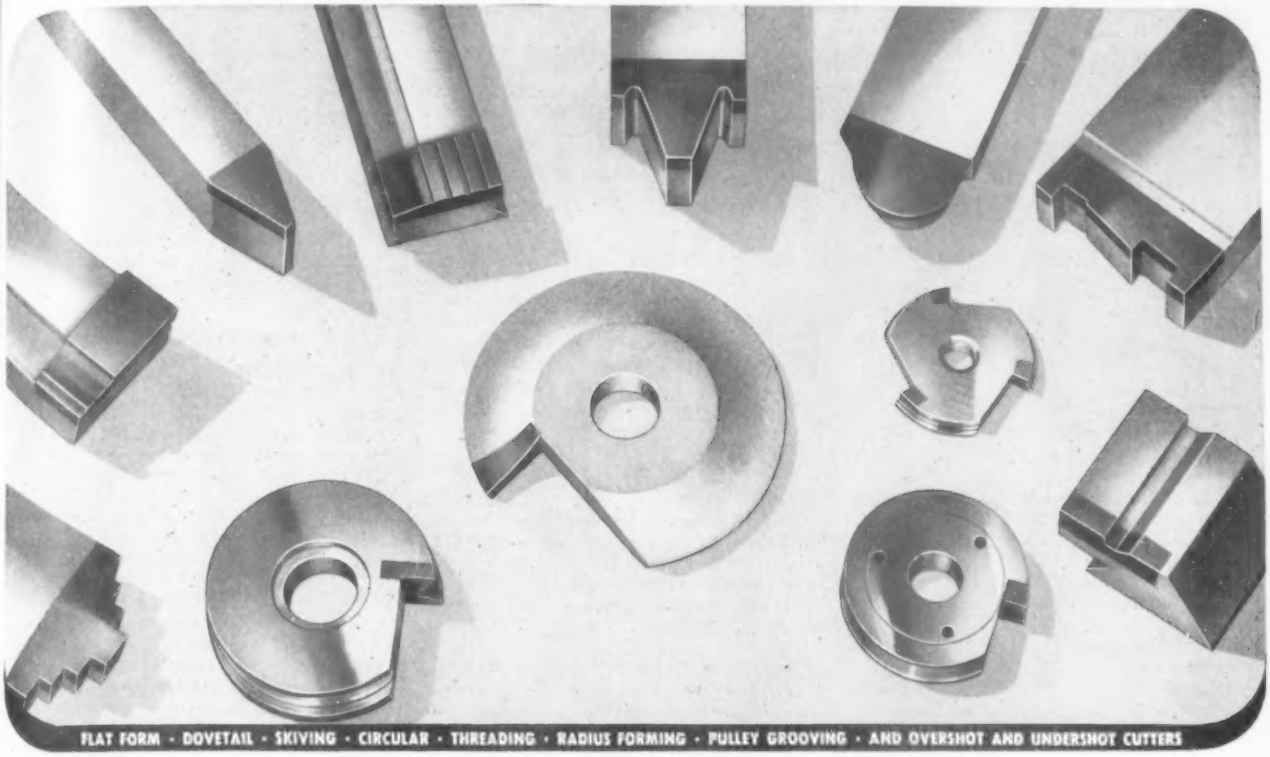

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A. S. T. E. CONVENTION REPORT

In the technical session on "Variable Machining Controls", G. A. Caldwell, Westinghouse Electric and Manufacturing Company, discussed "Electronic Adjustable Speed Drives".

Interest in Caldwell's description of electronic applications to machine tools was heightened by a visual demonstration with an electric motor and electronic control panel.

science of production, which included production engineering."

Toastmaster at the A.S.T.E. Banquet was a Past President of the Society, T. B. Carpenter, Vice-President, The Wickman Corporation, Detroit. William J. Gamble, Manufacturer's Agent, Buffalo, was Banquet Host.

Responsible for much of the success of the 12th Annual Meeting, National Officers said, was the Philadelphia Chapter Committee. Members were: General Chairman, A. E. Berdick; Assistant General Chairman, T. J. Donovan, Jr.; Reception Chairman, F. M. Crayton; Banquet Chairman, F. H. Jennings; Plant Visitation, C. O. Hersam; Entertainment, L. M. Widmann; Publicity, J. C. Sorensen; Technical Sessions, W. B. Rapp; Hotel Reservations, J. A. McMonagle; Attendance Chairman H. W. Gross; and Adviser, P. W. Frankfurter, Sr.

The Bellevue-Stratford's big South Garden was crowded to capacity when the Philadelphia Chapter held its Host City Luncheon March 27, featuring the appearance of distinguished military personnel, and wounded veterans of World War Two.

Addressing the production men on the role they have played in solving the Army Ordnance "Spare Parts" problem was Brigadier General E. F. MacMorland, Deputy Chief, Field Service Division, Office of the Chief of Ordnance.

Streamlined to meet war-time conditions, the two-day technical program was designed to enable the maximum amount of interchange of technical information useful in expediting war production.

Theme of the five technical sessions was "V-Day Tooling". Indicating the broadening interests of the tool engineers, session subjects featured included Production Engineering, Metal Finishing, Production Tooling and Personnel, Variable Machining Controls and Metal Removal.

In the opening session, March 27, a group of five engineers from the National Cash Register Company, headed by John W. Humphrey, Factory Manager, made one of the most dramatic technical presentations of the meeting. Described in detail was each step involved in the manufacture of one of the U. S. Army's "secret weapons". The panel revealed the complete job of tool engineering from blueprint to final inspection on a job which censorship prevents naming in print.

In addition to Humphrey, National Cash Register representatives included Gunnar Nelson, Engineer in charge of War Projects; Walter G. Boswell, Supervisor of Planning and Factory Layout; Frederick A. Schultz, Supervisor of Tooling and Foundry; Carl H. Kalbfleisch, Supervisor of Machining; and Edward W. Herman, General Foreman of Inspection.

METAL FINISHING SESSION

In a session on "Metal Finishing", A. F. Hasty, Sunnen Products Company, discussed the smaller types of machines and manual processes used in honing. Machines and processes applicable to large jobs were described by K. W. Connor, President, Micromatic Hone Corporation. Slides and sound movies heightened interest in this session. Both papers are presented in the technical section of this issue of THE TOOL ENGINEER.

All attendance records for a single A. S. T. E. session were broken when more than 700 production men crowded the Bellevue-Stratford Rose Garden and overflowed into adjacent hotel halls to hear colorful, William S. Jack of Jack & Heintz fame speak on "Production, Tooling and Personnel".

Crediting the sensational production achievements of his Cleveland factories to ingenious tooling and a personnel management based on his knowledge of "what every man and woman wants to get out of life", Bill Jack told substantially the same story of his organization as was revealed in a personal interview with this magazine in its September, 1943, issue.

As an example of the tool engineering which has made possible the famed Jack & Heintz production, Jack cited the case of a gimbal ring machined to

(Continued on page 109)

***Below*—From Cincinnati: (l. to r.) W. J. Frederick, Frederick Steel Company and A.S.T.E. Director; J. B. Elfring and Carl Flick, Chief and Assistant Chief Tool Engineer, respectively, Cincinnati Milling Machine Company.**

***Above*—R. A. Cole, Experimental Engineer, Grinding Machine Division, Norton Company, gave tool engineers the benefit of his company's research in the field of "Electronic Control as Applied to Grinding Machines."**

***Below* — "Application of Electronically Controlled, Adjustable Speed Motors to Lathes and Milling Machines" was described and illustrated by B. T. Anderson, Electrical Engineer, Sundstrand Machine Tool Company.**

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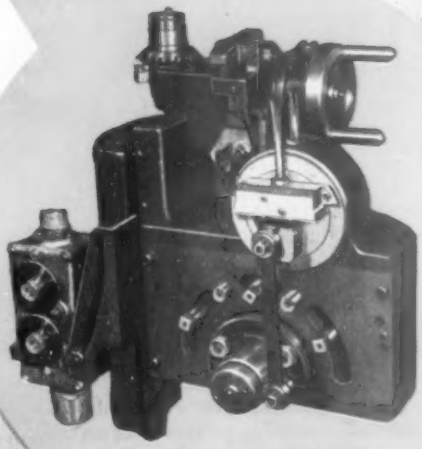

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a tolerance of .0002", with 18 different surface dimensions and requiring one hour and 52 minutes in production. Through the design of a special machine spindle, he said, this time had actually been cut to a bare two minutes, including delivery from floor to floor in finishing.

BILL JACK ON RENEGOTIATION

When Jack shifted the emphasis in his talk from engineering to "renegotiation", he brought his listeners to the edges of their seats. In a ringing denunciation of the present renegotiation law and the varying procedures used in its application, he charged that American industry is being penalized for efficiency. Despite the fact, he said, that his organization had cut the sale cost of a war product from the contract price of $4,400 to a delivery price of $2,900; despite the fact that last year he reduced his contract prices $55,000,000 and refunded $21,000,000, the renegotiation board left his company $200,000 on the delivery of $23,000,000 in war products.

"The more efficient we have become," he asserted, "the less they have left us".

In an informal dinner conversation with a Bramson Staff Editor before the meeting, Jack said that he had pledged himself to spend 16 hours in his plants every day he was in Cleveland. Since machine and tool design are so important in the success of his organization, he said, the current drain of skilled, youthful men by the armed forces may soon cut deeply into the over-all efficiency of his shops and be reflected in actual production.

Asked for an answer on the question, "will women stay in industry after the war?", Jack said his problem already was solved. Forty per cent of his 7,600 "associates" now are women. And every one of them, he said, understands that she is to give up her job to a returning service man when war ends.

A recording of Jack's talk was made, it was announced, and copies may be secured by writing Jack & Heintz, Incorporated, Bedford, Ohio.

One of the largest technical audiences in A.S.T.E. history assembled at Philadelphia to hear "Bill" Jack, colorful and dynamic head of much-discussed Jack & Heintz.

In a blistering attack on present renegotiation procedure, Jack brought more than 700 tool engineers to their feet, received a ringing ovation. The Cleveland production genius credits engineering and employee relations for the success of his company.

At a session on "Variable Machining Controls", a description of the hook-up and practical possibilities for the electronically controlled, adjustable speed motor was presented by G. A. Caldwell, General Mill and Resale Section, Industry Engineering Department, Westinghouse Electric & Manufacturing Company.

As an electrical device, the motor was described as a shunt wound, direct current motor, powered from an alternating current line. To operate the d-c motor from the a-c line, the a-c voltage is first changed to a suitable value by means of a transformer, and then rectified by the use of thyratron tubes. Interest in Caldwell's presentation was heightened by actual demonstrations with a motor and electronic control panel.

B. T. Anderson, Electrical Engineer, The Sundstrand Machine Tool Company, spoke on the applicability of the adjustable speed drive to lathes and milling machines.

MACHINE APPLICATIONS OF ELECTRONICS

Anderson selected three actual uses for detailed description. The first was a special lathe application, machining spiral grooves in the end plates of a cartridge reel. As first evolved for milling, the .065" by .070" groove was cut with a stationary tool. A production of 1.5 pieces per hour was obtained, and the operation required the services of a good toolmaker and tied up a toolroom machine.

Two automatic lathes were adapted to the operation. With variable speed drives installed, the production for the two machines was 10 pieces per hour. Only one operator was required to operate both machines.

The electronically controlled motor has been used on table feed drive on a special milling machine. The machine consists of a moving vertical column mounted on horizontal ways, a swivel type head with vertical power feed and a rotary table with the variable speed drive.

R. A. Cole, Experimental Engineer for the Norton Company, spoke at the "Variable Machining Controls" session on the application of electronic controls to grinding machines. The use of variable speed motors on the cylindrical grinding machine was related to wheel speed, work speed, infeed of the wheel to the work, and traverse speed.

Cole pointed to the search by the grinding engineer for a drive having an infinitely variable speed range, that was also smooth in its action. In ad-

(Concluded on following page)

Below—**(left to right) W. B. Peirce, Works Manager, Flannery Bolt Company, "Metal Finishing" session chairman; A. F. Hasty, District Manager, Sunnen Products Company, who spoke on "Honing Applied to War and Peace"; K. W. Connor, President, Micromatic Hone Corporation, whose illustrated talk was entitled "Honing Goes To War".**

Below—**Retiring A.S.T.E. President, Ray Morris, presiding at the 12th Annual Director's meeting. Executive Board *(left to right)*: E. V. Johnson, Secretary; C. V. Briner, Second Vice-President; Morris; D. D. Burnside, First Vice-President; F. W. Eaton, Treasurer; and I. F. Holland, Chairman, Constitution and By-Laws Committee.**

National Officers, Directors, Committeemen and distinguished guests were seated along one side of the Bellevue-Stratford's huge ballroom, scene of the Annual Banquet March 28.

Here is one such group of tool engineers. Left to right: A. E. Rylander, Detroit; R. M. Lippard, Worcester; R. B. Douglas, Montreal; and F. W. Curtis, Springfield, Past President.

dition to these two requirements, he drew attention to the need for freedom from vibration.

These requirements are satisfied, according to Cole, by the application of electronic drive.

Listing six prominent advantages obtained by application of electronic motor control, Cole then discussed each at length. Advantages are: adaptability of alternating current, wide speed ranges in either direction, automatic and instantaneous compensation for voltage drop, current limit features, operating speed control, and provision for jogging at preset or varying speeds.

Finely controlled wheel speed helps maintain a constant peripheral speed as the wheel is reduced in diameter. Work revolution control broadens the range of machine applicability, and can counteract substantial differences in wheel grade.

Cole concluded by stating that in the post-war period other types of electronic control will become available. "These," he said, "can be applied and results obtained that will challenge both the engineer and user in the production of better material."

Arthur Burgan, American Broach and Machine Company, ably covered a wide range of broaching fundamentals and applications in an illustrated talk in the session on "Metal Removal".

Beginning with historical development, and an analysis of tool requirements, he prepared the listener for consideration of the elaborate set-ups required for surface broaching and the factors important to setting up a broaching operation.

Two subjects which received a good reception were burnishing and surface broaching. Broaches made with burnishing shells are used for sizing and improving the finish of a surface. When used, he said, it is practical to hold the tool rigidly in a press, and push it through the work.

Burgan pointed out that requirments for surface broaching, more elaborate than others, with the exception of those which require guides to hold close tolerances for irregular internal shapes, are a fixture which will hold the work securely and a broach holder to hold the broaching tools.

NECESSARY REQUIREMENTS

Prime requisite is that there be sufficient production to justify the investment. Secondly, the strength of the work must be such as to be able to withstand the tool pressures which are usually higher than those on other machining operations. If these requirements are met, surface broaching is a fast, efficient method, according to Burgan.

Tool engineers attending the session on "Metal Removal" heard new techniques in fly cut milling described by Ralph R. Weddell, President, Weddell Tools, Incorporated. Evidence of interest in the re-birth of fly cutters was the gathering of production men who inspected the sample tools Weddell displayed after the meeting. Weddell's talk is presented in the technical section of this issue of THE TOOL ENGINEER.

THE END

Left—A.S.T.E. National Officers occupied the top tier of banquet tables along one side of the ballroom. Right to left, as viewed from the ball room floor: A. L. Potter, Executive Secretary; L. G. Singer, Assistant Secretary-Treasurer; F. W. Eaton, Treasurer; W. B. Peirce, Third Vice-President; and A. M. Sargent, Second Vice-President.

Below—Last of five technical sessions was devoted to "Metal Removal". Left to right: Session Chairman Floyd W. Eaton, Crawford Door Company; Ralph R. Weddell, Weddell Tools, Incorporated, who spoke on "Fly Cutters"; and Arthur Burgan, American Broach & Machine Company, who discussed "Broaching Fundamentals and Applications".

Below—From the standpoint of attendance, the Philadelphia banquet was the most successful in the Society's 12-year history. More than 1,200 attended, according to officials. Here is another group of Directors. Left to right: L. J. Radermacher; A. M. Schmit; L. M. Cole; H. Wentzel; and W. W. Young.

APPRENTICE TRAINING

(Concluded from page 101)

chine building industry.

The course is designed to give potential tool-makers and machinists a working knowledge of the following:

1. How to process a new product
2. How and why to use a definite machine for a definite job
3. How to make a factory floor layout with aid of time study and burden
4. How to plan any type job
5. How to arrive at a cost price

This course is based upon the conception of wartime and peacetime industrial production. The students actually plan and lay out their own shop production of parts for a Diesel tractor starting engine.

They deal with records, route sheets, tool orders, time-study, burden, assembly and layout, cost accounting, purchasing, material control, and the many other items involved in production.

Tool designing is one of the most important branches of shop operation, as good tooling forms the basis of lost-cost, interchangeable manufacturing. The degree of efficiency obtained by a tool is largely dependent upon the inventiveness of the tool designer.

PRACTICAL TOOL DESIGNING

Since the success or failure of a die, a jig, or a fixture depends entirely upon the underlying design principles, this course has been devised to give a sound background in effective and practical tool designing. This course includes:

1. A review of lettering and drawing
2. A general tool design picture
3. An explanation of assembly and detail drawings
4. Detailing an assembly
5. Three basic methods of designing jigs and fixtures
6. Construction and use of locators, clamps, ejectors, jacks, eccentrics, "V" block construction, and designs.
7. Designing procedure
8. Designing of jigs, fixtures, and gages
9. Motion pictures on good and bad constructions and effective tooling methods for production.

GEARS AND INDEXING COURSE

The textbook used was prepared by the company and is based upon tool designing principles developed over a period of years by Caterpillar and other manufacturers.

The gears and indexing course is created to remove the mystery from spur gears and to be of lasting value to the mechanic or designer.

This course covers the development of the friction drive which results in a gear. Included also is the transition from former types of gears to the present universally used involute system and its simple variations. The students actually develop the tooth outline of many sets of gears. A thorough understanding of the involute tooth form and the proportions for spur gears precedes the study of gears.

Gear manufacturing processes are included along with a study of inspection and checking methods. Last is the study of the methods and principles used to set up indexing equipment, including the universal indexing head and various indexing machines.

THE END

Welding Equipment & Supply Co.

PRESENTS

SEE A **FREE** SHOWING OF THESE SOUND SLIDE FILMS ON TOOL STEEL WELDING

These sound slide films entitled "Let's Get The Low-down" and "Let's Do It Right" are the only completely compiled technical information available *anywhere* on the advantages of, proper procedure and application in Metallic Arc tool steel welding. Companies have already realized definite savings in materials and man hours through the information contained in these films.

Let your master mechanics, superintendents, foremen, welding operators, designing engineers, process and tool conservation personnel *see* and *hear* this vitally important sound film.

These 35 mm sound slide films will be shown to your organization without obligation.

THIS BOOK TELLS ALL!

This book is available to all those men who have seen this double feature, and serves as a "refresher" of the technical data contained in the film.

Welding Equipment & Supply Co.

WELDING ENGINEERS WITH A COMPLETE SERVICE

223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN

What would be a better investment for you than to have your plant personnel see the many advantages in this specialized welding field? These films can be exhibited with any standard 35 mm sound projection equipment. Write us today for details.

HOW TO IMPROVE ACCURACY AND STRENGTH OF SPLINES

AT NO INCREASE IN COST

Here stronger — involute — splines are being finished on a Michigan Gear Shaver at 70-80/hr. to virtually zero backlash (tolerances: 0.0001-0.0002″). The saving in hobbing cost alone offsets the expense of the shaving operation.

For complete information on gear finishing, ask for Bulletin GF-43

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD • DETROIT 12, U. S. A.

BUY U.S. BONDS STAMPS

MACHINE TOOLS

. . . news and trends in the Machine Tool Industry . . .

PRODUCTION TRENDS

● January cancellations, shipments and backlog fall off

Though the decline was less precipitous than in the previous month, machine tool shipments continued into the 13th uninterrupted month of skidding from the levels of late 1942.

Statisticians of the Tools Division of the War Production Board closed their record books, gathered up their adding machine tapes and announced:

Machine tool shipments in January, 1944, totaled $57,001,000, or about 6 per cent less than in December, 1943.

Near saturation of the domestic war plant market, and dropping foreign requirements are reflected in a comparison between shipments in December, 1943 and in the same month in 1942. In December last year, according to WPB figures, shipments totaled $60,680,000. In the peak month of December, 1942, the total value of machines sold by the industry amounted to $131,960,000.

Total firm orders in January of this year had a value of $31,030,000, or 8 per cent less than the $33,728,000 value in December, 1943. Cancellations in January were $3,229,000, leaving the total of net new orders at $27,801,000.

A big and pleasant surprise for the industry was the January drop of 47.4 per cent in cancellations from the December figure of $6,138,000. Net new orders in December were $27,590,000, slightly less than in January.

The industry keeps its eye on the backlog. WPB statistics revealed that $182,333,000 worth of machine tool business is still marked up in the industry's order books. This is a reduction of 13.7 per cent from the $211,278,000 backlog at the end of December.

The WPB describes these January figures as preliminary. Actually, they are based on reports from 303 companies, whose shipments in the preceding month represented 84.2 per cent of the so-called machine tool industry. The report assumes that shipments of the remaining companies declined at approximately the same average rate.

ANNUAL FORUM

● Westinghouse schedules ninth annual machine tool meeting

PITTSBURGH—Prominent machine tool users and builders are circling May 1 and 2 on their calendars. On that date, hundreds of them will gather here for the ninth consecutive year, attending the 1944 Westinghouse Machine Tool Electrification Forum. Meeting scene will be the William Penn Hotel.

While the technical sessions will be devoted to new machine uses, designs and electrical applications, future trends of the machine tool industry itself undoubtedly supplant all other subjects in informal conversations. Well aware of this important fact, Westinghouse has announced that "many of the problems facing machine tool manufacturers and users today and in the future, will be discussed by recognized experts during the two day sessions." This year's Forum is planned to provide an opportunity for machine tool engineers and executives of machine tool builders to discuss electrical problems relating to design and function of machine tools.

Range of subjects covered in formal discussions is being broadened this year with the presentation of papers of interest to executives and commercial representatives of the industry. Separate meetings will be held simultaneously.

Westinghouse has announced that a portion of the Forum time will be turned over to the National Machine Tool Builders' Association for a session on post-war standards for electrical equipment on machine tools. Tell Berna, General Manager of the Association, is to be chairman at this discussion.

● What is the post-war outlook for the machine tool industry? For the interest of TOOL ENGINEER readers, who are buyers and users of machine tools, leaders in the industry have been invited to present their views of this vital question

MODERN MACHINES WILL PRODUCE MORE

☆

WILLIAM L. DOLLE
PRESIDENT
THE LODGE & SHIPLEY
MACHINE TOOL COMPANY

LODGE & SHIPLEY'S DOLLE

"Many of the machines built during the past five years are obsolete . . ."

● Many people interested in the post-war problems of the machine tool industry are worrying unnecessarily about the disposal of excess war-built machines, about the implications of the full decade of normal production packed into the last three years.

If this industry is to survive and enjoy any semblance of prosperity, those problems must be largely forgotten by the machine tool builders—and in a hurry. There is little that manufacturers of those machines can do now about the problem of disposing of them, getting them out of the way so that new machines can be sold for peacetime production.

Though the industry should and will lend its council to those agencies eventually vested with responsibility for selling thousands of publicly-owned machines, the mills of government grind slowly. We can't wait for Washington to settle that question.

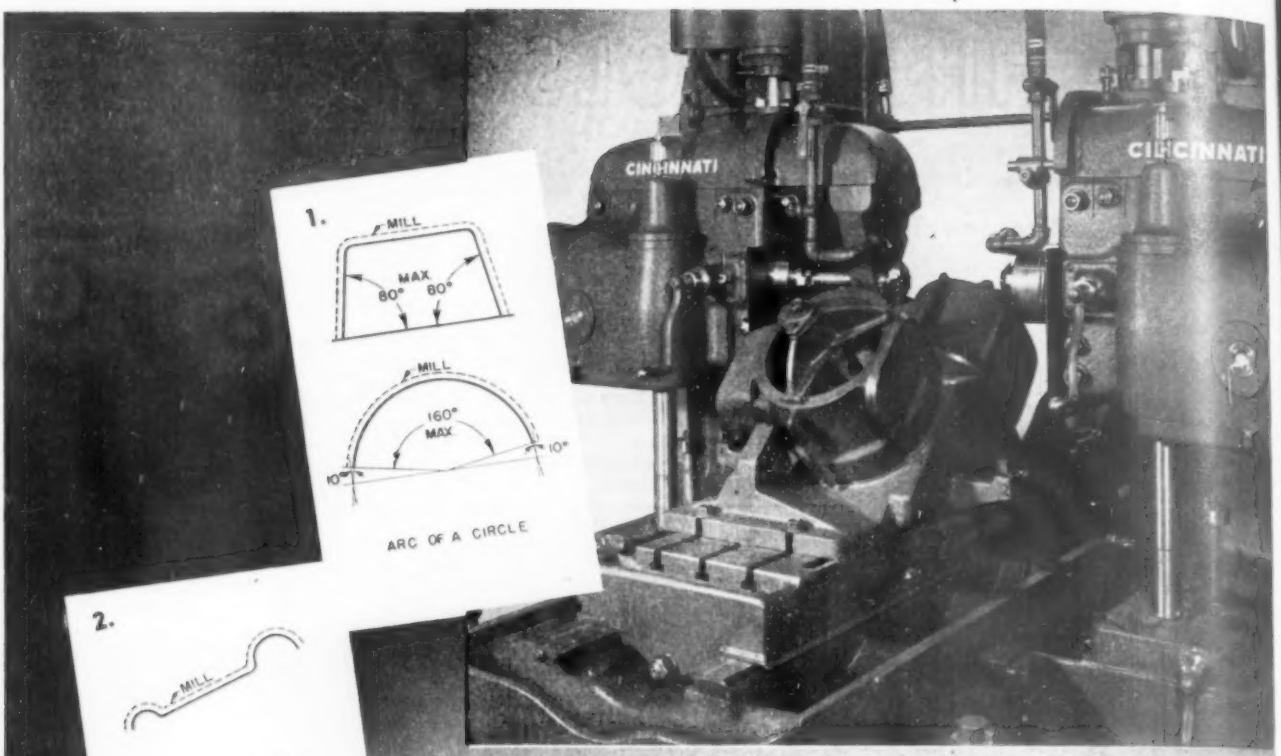
We have workers—skilled American workers—that we want to keep employed. The only way we can do that is to build more machines. How will it be done?

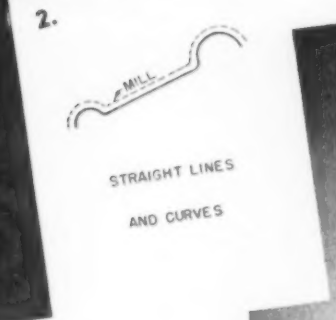
Many a good machine has suffered from misuse in the hands of unskilled war workers, from cramming a full decade of normal output into two or three years of 'round-the-clock operation. Those machines must be rehabilitated. More old-line machine tool builders will do that work in their own shops.

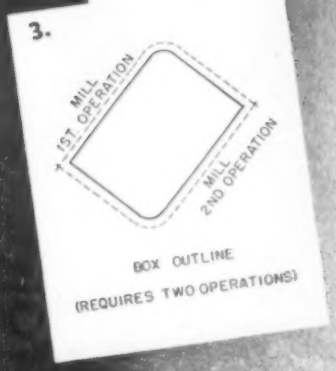
New markets will be sought, mass-manufacturers will be convinced that a new, modern machine will produce more—will cut production costs. Already the automobile industry is aware of this fact. We know that it needs and wants many new machines. And that is only one post-war industry.

War-born developments in fabricating methods—and cutting tools—have opened a new vista for machine tool designers. Many of the machines built during the past five years are obsolete insofar as their suitability for handling cost-cutting carbide tools is concerned. They are not sufficiently rigid, nor do they have the required spindle speeds.

Production men will demand stronger, faster machines. This industry will build and sell such machines.







Tracer Controlled

HYDROMATIC

Mills Uphill and Down and On the Level, Too

The Tracer Controlled group of Hydromatics, an offspring of the family of standard CINCINNATI Hydromatics, offers new possibilities in production milling which may be applied *now* in retooling for more economical production. And today's application of the tracer method of milling will suggest better machining methods when your war contracts terminate; when you must find a way to produce new things that will provide needed jobs.

Basically, Tracer Controlled Hydromatics accurately mill uphill and down, within the angle of inclination indicated in Figure 1. The longitudinal table feed and the vertical feed on the spindle carrier are actuated hydraulically and synchronized through a tracer valve mechanism which contacts a master template attached to the fixture. The profiles to be milled may be straight lines or curves, or a combination of the two. Even a box shaped profile can be handled in two operations. Three possibilities as sketched at upper left.

If you are faced with design changes or increased production schedules, perhaps the Tracer Controlled Hydromatics can be applied to meet the new requirements more quickly. Most certainly they deserve consideration in your post war methods planning. In either case, our engineers will be glad to assist with your plans.

Below: **Duplex Tracer Controlled Hydromatic Milling Machine. Complete information may be obtained by writing for Catalog M-1295.**

CINCINNATI

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.

INDUSTRIAL NEWS DIGEST

. . . a review of significant developments and new techniques in mass production industries . . .

GEAR PRODUCTION

● Early '44 output slumps; gear-making machines now available

PITTSBURGH—Gear production, for the first time in months, headed into a sharp nose dive in January, the American Gear Manufacturers Association has revealed.

A decrease of 36½ per cent in volume of sales for January, as compared with the preceding month, was reported by the industry as represented by members of the Association. This report, it was said, does not include turbine or propulsion gearing. The Association's January index stood at 246.

The availability of a substantial quantity and variety of gear producing machinery has been made known to members of the Association, it was learned.

New gear producing equipment, listed from the records of the Redistribution Division of the War Production Board, was said to be available in pool order stock of three machine tool concerns. Other machines were said to be available for purchase in plants of four different companies.

The list distributed to AGA members was described as "representative" of the gear machinery available.

CUTTING TOOLS

● WPB Advisory Committee formed for metal cutting saw makers

WASHINGTON — Formation of a Metal Cutting Hack and Band Saw Industry Advisory Committee has been announced by the Office of Industry Advisory Committees of the War Production Board.

Members of the committee are: H. G. Aldridge, Huther Bros., Rochester, New York; Jacob S. Disston, Henry Disston & Sons Co., Philadelphia; R. F. Fllis, E. C. Atkins & Co., Indianapolis; J. H. Flavell, W. O. Barnes Co. Inc., Detroit; William J. Green, The L. S. Starrett Co., Athol, Massachusetts; Ralph K. Lawrence, Simonds Saw & Steel Co., Fitchburg, Massachusetts; Donald McQuillan, Spartan Saw Works, Springfield, Massachusetts; Daniel K. Northup, The Henry G. Thompson & Son Co., New Haven, Connecticut; Verne Olson, Contour Saws, Inc., Des Plaines, Illinois; Phillip Rogers, Millers Falls Co., Greenfield, Massachusetts.

The new committee held its first meeting in Washington March 1. William C. Teare, Tools Division, WPB, has been appointed the Government presiding officer.

Further standardization of specifications for hack saws and band saws was recommended at the first meeting of the Industry Advisory Committee.

Committee members, reviewing the list of sizes and types of saws permitted to be manufactured, agreed that steps leading to conservation of materials and manpower, as well as increased production, should be taken.

A task committee, appointed at the meeting is studying proposals for standardizing the packaging of hack saw blades and band saws in order to conserve paper and manpower.

Members of the committee agreed that distribution of hack and band saws through mill supply outlets to war plants was satisfactory.

WPB PROMOTION

● Mulac named Assistant Director of the Tools Division

WASHINGTON—Anthony A. Mulac

(Continued on following page)

PRODUCTION FOR RAILROADS

Baldwin Locomotive Works executives pictured with the 70,000.h locomotive produced by the famous engine manufacturer.

Spotlighted in news of a critical war industry was the recent completion of the 70,000th locomotive built by The Baldwin Locomotive Works. Purchaser of the historic unit was the Army.

Inspecting the locomotive at the company's Philadelphia plant are (l to r) Ralph Kelly, Baldwin president; W. H. Holcomb, operations assistant to the president; and W. G. Stetson, general foreman of the erecting shop.

Since its founding 112 years ago, the company has completed an average of one locomotive every 14 hours.

"GREENIE" *She Approves Steady Rests*

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

HOLY SMOKE, GREENIE— WHAT'S THE BIG IDEA OF TAKING LIFE EASY INSTEAD OF ATTENDING TO THE GRINDER?
WHY, BOSS— YOU TOLD ME YOURSELF THIS IS LONG WORK AND THAT I WOULD NEED PLENTY OF RESTS!
RALPH DAVIS

(Continued from preceding page)

has been appointed an Assistant Director of the Tool Division in charge of the War Production Board Industrial Specialties Branch. L. R. Boulware, Operations Vice Chairman of WPB made the announcement.

Mulac has been associated with WPB and its predecessor organization, Office of Production Management, since August, 1941. Originally, he gave his time largely to cutting tool problems. Since September last year, he has been Chief of the Industrial Specialties Branch, which includes Sections handling abrasives, chain, cranes, and hoists, metal cutting tools, foundry equipment and supplies, gages and precision measuring tools, heat treating equipment, portable electric and pneumatic tools, and other industrial supplies.

Long associated with the cutting tool industry, Mulac came to Washington from the United Drill and Tool Company, Chicago, where he had been employed in a consulting capacity.

INDUSTRY ORGANIZES

● Tool and Die makers form association, reveal plans

WASHINGTON—A program to prepare the tool and die industry for orderly post-war conversion has been set into operation by the recently-organized National Tool & Die Manufacturers Association.

Long recognized as the "trouble shooters of industry" by mass manufacturers, members of the tool and die industry played a fundamental role in converting from peace to war by designing and building much of the special tooling required for armament production, according to the association's General Manager M. W. Rowell.

"This program should be of interest to every industry in the country that is planning for post-war," Rowell said. "Before anything can be manufactured, especially the new products contemplated when peace comes, tools and dies have to be designed and built.

"Drill presses selling for $700 or other machine tools costing $40,000 and more remain idle unless they have the necessary 'brain' equipment in the form of tools, dies, jigs and fixtures."

As part of the association's program, a survey is being made of the tool and die industry's facilities and output in order to assist manufacturers in making an orderly transition to peacetime production. Toward this end, Rowell is seeking the cooperation of tool and die shops, requesting them to contact the association in Washington.

The association, organized in September, 1943, elected as president L. A. Sommer, president, The Sommer and Adams Company, Cleveland. R. F. Moore, president, Moore Special Tool Company, Incorporated, Bridgeport, Connecticut, is first vice president; W. G. Ehrhardt, president, Ehrhardt Tool & Machine Company, St. Louis, second vice president; H. V. Anderson, president, Crescent Manufacturing Company, New Britain, Connecticut, treasurer.

Members of the association board include B. Buerk, president, Buerk Tool Works, Buffalo; C. A. Erickson, president, Erickson Machine Works, Incorporated, Minneapolis; K. Janiszewski, president, Superior Steel Products Corporation, Milwaukee; and W. R. White, Jr., vice president, Midwestern Tool Company, Chicago.

Reconversion to peacetime production must take into consideration the renegotiation problems of the tool and die industry, Rowell stated in pointing out that the industry consists of about 4,000 small shops, each employing from 5 to 60 men in normal times.

"Each shop usually is owned and managed by one or two individuals," he said, "who, basically, are craftsmen. They are not and never have been profiteers."

Another phase of the association's program, it was stated, will be correlation of the new ideas developed by tool and die plants for the engineering and designing of tools and dies for war materiel.

Pointing to the wartime job done by the industry, the association general manager quoted General Levin H. Campbell, Chief of Ordnance, U. S. Army, "You fellows saved our lives."

The organization's work to date includes the establishment of nine local groups in as many tool centers. Those already functioning are located in Cleveland, Bridgeport, St. Louis, Rockford, New Britain, Buffalo, Minneapolis, Milwaukee and Chicago. Additional centers now are being formed, it was stated.

NEW DESIGNS, MATERIALS AND SURFACE TREATMENTS

No segment of American industry deserves more credit than cutting tool manufacturers for the victory we have achieved on the production front. Likewise, future trends in mass production metal working are contingent on wartime and post-war developments in cutting tool design and materials. Here is another in The Tool Engineer magazine series on the post-war outlook from the viewpoint of prominent cutting tool producers.

KENYON Y. TAYLOR, JR.
VICE PRESIDENT
CHARLES H. BESLY AND COMPANY

THE metal-cutting industry has passed through the first frantic tooling phase of war production with flying pennants, and the results of the present high production period are evident on all battle fronts. We are now faced with a complex re-adjustment period with many unknown variable factors.

The industry recognizes its responsibility concerning post-war employment, manufacture, and distribution; however, in order to properly shoulder this responsibility we must be permitted adequate financial reserves; free initiative, unhampered by government regulation and regementation; and a voice in the redistribution of surplus, government held cutting tools.

". . . the industry is well prepared to make a great contribution . . ."

Assuming that these fundamental rights are granted, the industry is well prepared to make a great contribution to the development of improved machining techniques, lower costs, and a better standard of living.

Radical changes in design, material, and surface treatment will obsolete present manufacturing methods and create an adequate post-war market.

SAE SCHEDULE

● Automotive Engineers announce technical meetings for year

NEW YORK — Continuing its intensive program of engineering help to war-busy production men, the Society of Automotive Engineers has announced nine national meetings scheduled for 1944, and an annual meeting in January 1945. Each meeting is directly related to pertinent phases of the SAE War Engineering Programs, it was said.

Purpose of the meetings, according to SAE General Manager John A. C. Warner, is "mass dissemination of technical data essential to mass-production of war materiel."

The meetings will be held in war manufacturing centers to accommodate busy engineers. The schedule:

April 5-7, National Aeronautic Meeting, Hotel New Yorker, New York.

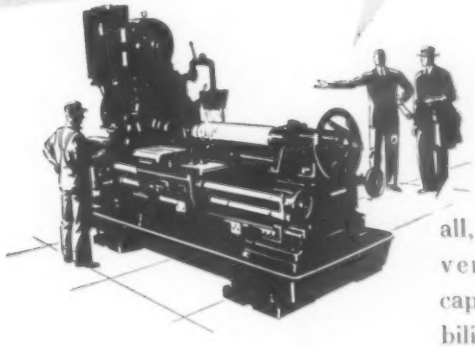
May 17-18, National Diesel-Fuels & Lubricants Meeting, Hotel Knickerbocker, Chicago.

June 5-7, National War Materiel Meeting, Book-Cadillac Hotel, Detroit.

June 28-29, National Transportation

(Continued on page 118)

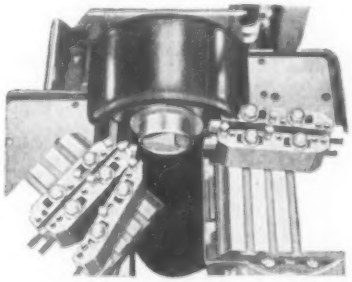
"It was worth our time looking the leading lathes over. We finally chose L+S, because it proved best for our needs"



ON one point or another, a good word can be said for most lathes on the market today. The way to lasting satisfaction, however, lies in consideration of *all* factors of lathe value. Our suggestion is: measure what you get in different makes . compare points of design, new improvements, flexibility, etc., in relation to production, costs, and all-over efficiency.

In making such comparisons, you'll profit by considering L & S Lathes. For in L & S Lathes you get the final perfected result of *52 continuous years of specialized lathe experience* . . . 52 years devoted to making *lathes and lathes only* . . . and making them, all in all, unequalled in accuracy, versatility, productive capacity, and rugged durability.

This vast fund of accumulated lathe experience can help perfect your production, whether your plant is large or small. Call on Lodge & Shipley engineers . . . they'll gladly show you what can be done.



A BIG STEP FORWARD IN LATHE DESIGN

The No. 3-A Duomatic Lathe is designed for quantity production in a wide range of cycles. Dual carriages and tool slides—front and rear—permit more advantageous use of multiple tools in turning, and straight and angular operations. Illustration shows three tools front and three tools rear, arranged in universal tool holders for machining thrust bearing cage. Write for Bulletin 601-FL.

Prepare for the Coming
BATTLE OF MARKETS!

Your peacetime products will be on their own against competition keener than ever before. Call on Lodge & Shipley engineering and manufacturing experience to help you plan now for quick conversion when and as conditions warrant. Don't be caught napping!

Engine—Automatic—Tool Room—Oil Country Lathes

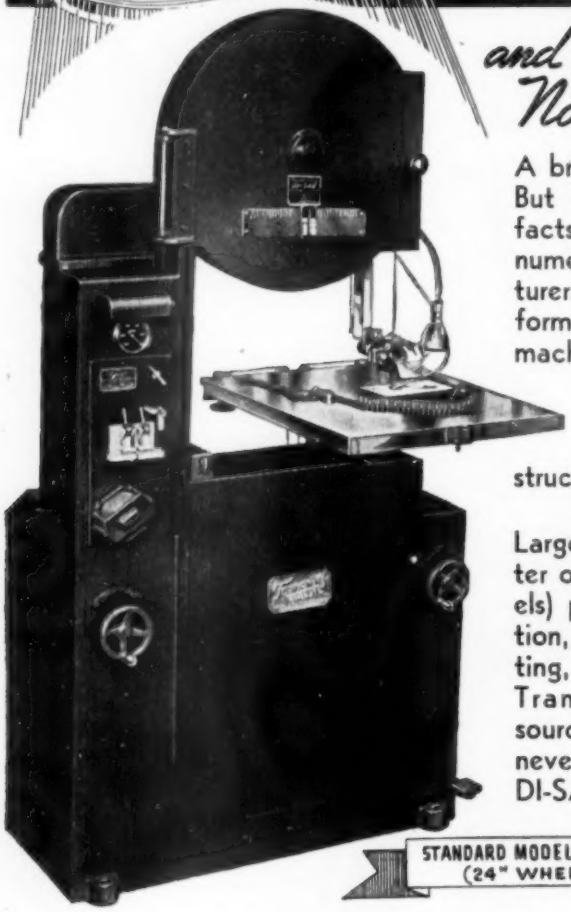
THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, 25, OHIO, U. S. A.

L & S LATHES

INVESTIGATE Tannewitz DI-SAWS

and You'll Want No Other!



A broad statement? Yes. But soundly founded on facts—the experience of numerous large manufacturers — the actual performance records of the machines, themselves — and fundamental superiorities of design and construction.

Larger wheels (24" diameter on the standard models) provide greater traction, faster, straighter cutting, more production. Transmissions, common source of die saw grief, never fail in TANNEWITZ DI-SAWS.

STANDARD MODEL No. M24 (24" WHEELS)

Sturdier, heavier construction throughout, plus many refinements of design, make these machines the greatest, trouble-free producers in their field. It pays to buy the best!

With a TANNEWITZ DI-SAW you can do in minutes jobs which require hours by the shaper, miller or lathe methods.

Get the complete facts. Just write for DI-SAW bulletin.

Other Models to Handle Work of Practically Any Size

Made with 30", 36", 48" and even larger throat capacities if desired, the TANNEWITZ "Big Bertha" models make available the tremendous savings of inside and outside sawing, filing and polishing on dies, jigs and other work of practically any size. Write for bulletin.

On request: Bulletins on Single and Variable Speed Foundry Band Saws; Sheet Metal Cutting Band Saws.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

INDUSTRIAL NEWS DIGEST

(Continued from page 116)

& Maintenance Meeting, The Bellevue-Stratford, Philadelphia.

August 24-25, National West Coast Transportation & Maintenance Meeting, Multnomah Hotel, Portland.

September 13-15, National Tractor Meeting, Hotel Schroeder, Milwaukee.

October 5-7, National Aircraft Engineering & Production Meeting, Engineering Display, Hotel Biltmore, Los Angeles.

November 9-10, National Fuels & Lubricants Meeting, Hotel Mayo, Tulsa.

December 4-6, National Air Cargo Meeting, Hotel Knickerbocker, Chicago.

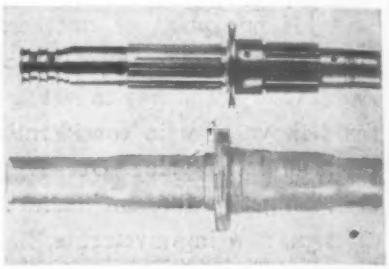
The SAE annual conclave has been scheduled for January 8-12, 1945, Book-Cadillac Hotel, Detroit.

SAE Sections in 25 industrial centers are expected to cooperate in developing the technical programs scheduled, it was explained.

MATERIALS

PLASTIC GUARD

● Inexpensive jacket protects machined parts in process



P & W Aircraft photo

Two-section plastic protective shield for engine part developed by Pratt & Whitney Aircraft. The tough cover, made of rejected laminated acetate, protects part after finish grind.

EAST HARTFORD, CONN.—Believed to be the first application in the aircraft industry, protective plastic covers for parts in process are now in routine use here by the Pratt & Whitney Aircraft Division, United Aircraft Corporation.

A clutch drive shaft was the first part to receive the benefit of such protection. Machined with splines on two of its dozen diameters, with two threaded sections and four micro-finished surfaces, the shaft was extremely susceptible to damage in process. Its largest diameter acted as a wheel and shafts frequently rolled against each other, resulting in nicks and scratches. Search for a method of protection led to the development of the plastic container which is fitted after heat-treat and finish-grind operations, and guards the part as it progresses toward final inspection.

Laminated acetate plastic rejected as below specifications for bomber use is employed. The cover is molded in two sections conforming closely to various shaft diameters and interlocking over

(Continued on page 120)

THERE'S A CLEVELAND Specially Suited to CUT COSTS

on 9/16" to 2 1/2" Bar Stock Machining

. . . because on any machinable metal, round, hex or square, with a broad range of outside and inside cuts, *it sets up quickly,* then produces rapidly, multiple operations often requiring two or more individually manned machines of other types . . . Clevelands are economical production units on *fifty pieces or thousands.* This goes for each of the many types and sizes which give a production range from 9/16" to 10" stock in overlapping capacities. • There's a Cleveland for almost *every type of bar stock machining.* Also Cleveland Made high-pressure hydraulic die-casting machines for magnesium, aluminum, bronze, brass, zinc, tin or lead. Write for Cleveland bulletins on automatic, or die-casting equipment . . . or let us prove Cleveland economy by figuring YOUR job, from blueprints in your own plant.

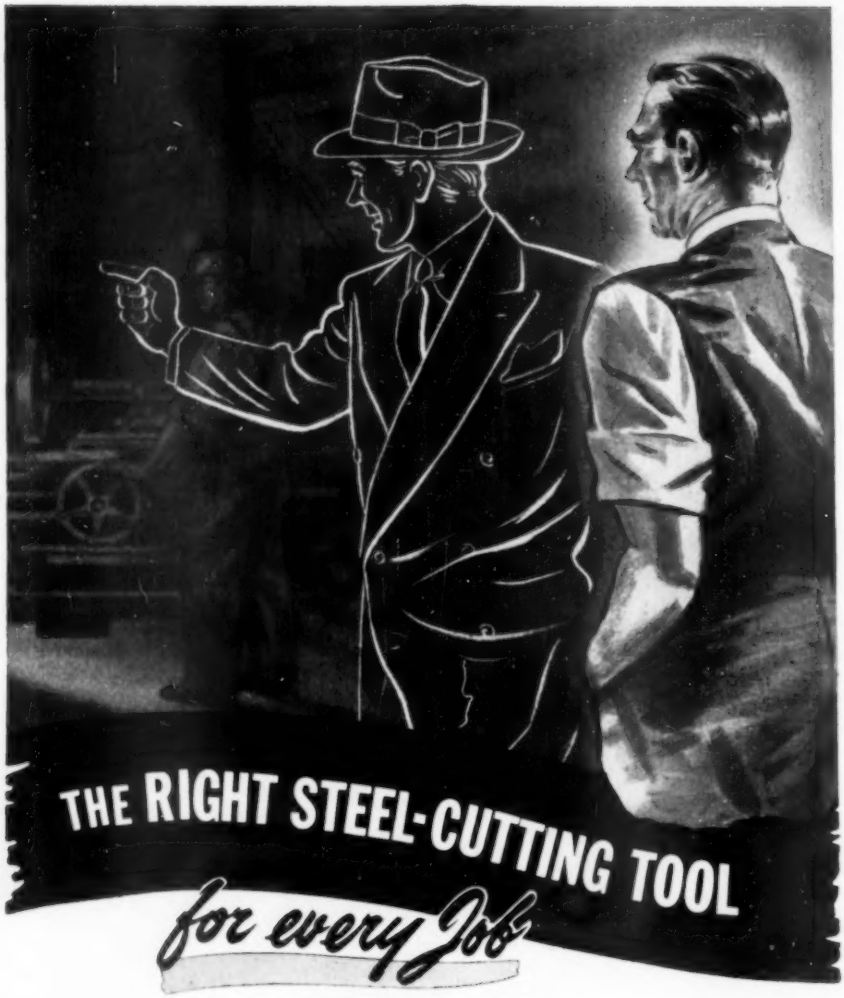
Remember—
CLEVELANDS CUT COSTS!

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND 3, OHIO

SALES OFFICES

CHICAGO: 1408 Civic Opera Building
DETROIT: 540 New Center Building
NEWARK: 902 American Insurance Building
CINCINNATI: 1315 American Building



To get maximum steel-cutting production—consult KENNAMETAL field engineers about the proper application of KENNAMETAL, the wear-defying tool material whose chief ingredient is a unique, super-hard intermetallic compound (tungsten-titanium carbide). KENNAMETAL engineers will help you . . . (1) select the right grade . . . (2) choose the correct tool style . . . (3) determine the most efficient machine set-up . . . (4) install a money-saving tool maintenance program.

Yes, KENNAMETAL engineering service assures the *right* KENNAMETAL tool on every job . . . and performance studies show that the *right* KENNAMETAL tool, used properly, often can remove stock from the toughest steel up to 3½ times more efficiently than other carbides! There's a KENNAMETAL field engineer in your locality. Ask him for advice—and always keep a copy of our Tool Manual on hand. Write for one today.

KENNAMETAL

Trade Mark Reg. U.S. Pat. Off.

KENNAMETAL *Inc.*
600 Lloyd Ave., Latrobe, Pa.

SUPERIOR CEMENTED CARBIDES

(Continued from page 118)

the largest o. d. The ends extend far enough beyond the piece to protect it and are open to avoid condensation and corrosion.

Regarding life of the cover, P & W engineers state none has yet worn out. Use of the covers on this one part has reduced scrapped shafts, saved hours in rework, and has kept the flow of critical parts uninterrupted. Despite the relative weight of the shaft and the lightness of the plastic container, the unit may be dropped from bench level to the factory floor numerous times without damaging either part or cover.

Similar covers for four other shafts have been designed. A cap to protect threads of crankshaft bolts, with red and white ends to identify the right- and left-hand threads has been produced. Other casings are being made for highly finished plated and lead bearings.

Stemming from this development, tubes to protect the threads of lifting eyes, valves and knuckle pins are being produced of non-corrosive paper by Pratt & Whitney Aircraft.

PROTECTIVE CLOTHING

● ASA sets war standards for metal working industry

NEW YORK—The first three of a series of war standards for Protective Occupational Clothing have been approved by the American Standards Association. These are: American War Standard for Leather Aprons, for Leather Cape Sleeves (with or without bibs), and for Leather Leggings (knee length).

Covered in the new standards are specifications for different types of leather aprons, cape sleeves and leggings, which the committee considered necessary to adequately protect men and women engaged in metal working occupations.

The garments described are intended to afford protection from sparks, molten metal, infra-red and ultra-violet rays, and limited impact forces. It is expected, ASA states, that application of these standards will enable substantial savings in critical materials.

For copies write ASA, 29 West 39th Street, New York 18.

POWDER METALLURGY

● New association formed; divisions announced

PITTSBURGH—Growing importance of the new technology of powder metallurgy and related industrial processes was indicated here last month in the formation of the Metal Powder Association.

H. E. Hall, newly elected president, points out that the organization has been divided into four branches: Metallurgical powder, chemical powder, metallic paint pigment, and pyrotechnic powder.

Offices of the new association are at 60 East 42nd Street, New York.

(Continued on page 123)

VETERAN!

Unretouched photo of a National milling cutter after long and hard service. Because of regular resharpening this cutter lasted far beyond its normal life expectancy.

Hours can be added to the useful life of cutting tools by a policy of regular resharpening. Sharp tools last longer, produce more and better work.

NATIONAL

NATIONAL TWIST DRILL & TOOL CO. DETROIT U.S.A.

TWIST DRILLS
REAMERS, HOBS
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SPECIAL TOOLS

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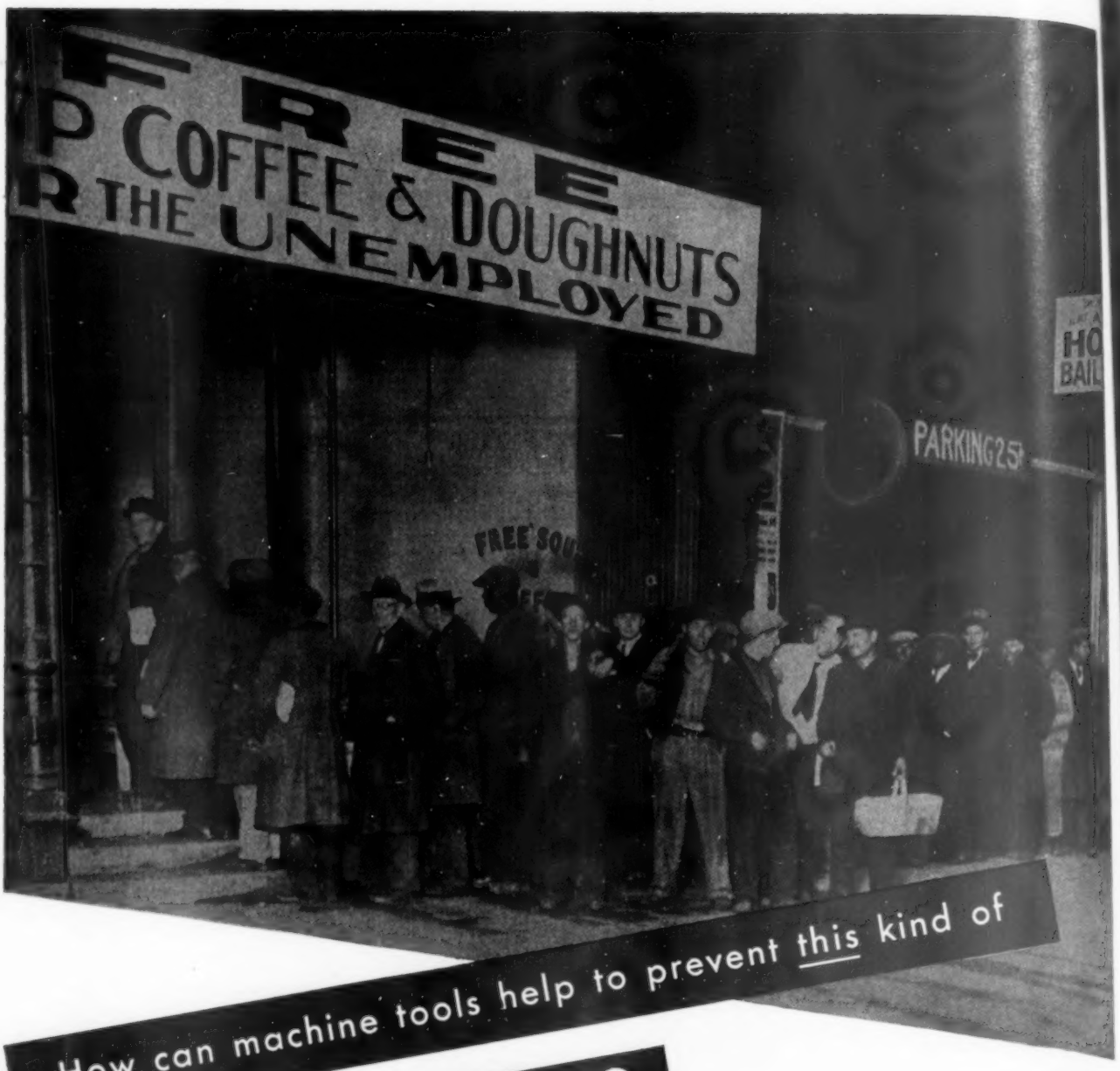

How can machine tools help to prevent this kind of Victory?

Remember the big parade of the breadline— the march of the bonus army — the victorious men selling apples? Many an American hero tasted those bitter fruits of victory, and the war to end war ended nothing.

What kind of victory will this one be? It *can* be the great one American boys are giving their lives for — but they alone can't make it so. For victory in peace, as in war, must be planned ahead . . . and in peace, *you're* one of the Generals.

If you are a manufacturer, there is a small group of basic machine tool engineers who can help you to plan now for the kind of victory we've told our sons they're fighting for.

One of these engineers is a Bryant man. We urge you to call him today. For his specialized knowledge of internal grinding machinery is important to the manufacture of literally *everything* that will make this country a finer place: this victory a victory that we shall not be ashamed of

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U. S. A.

(Continued from page 120)

MOTOR MEMOS

Sorensen bows out as Ford production chief after 39 years with motor genius. Packard plans to double output this year. Fisher reveals its "secret job"

DETROIT—Departure from the production front late last month of one of motordom's most colorful figures crowded all other news of the industry from the spotlight.

From Nash's noonday executive round table in the Kenosha Elks Club to the last foreman's office in Chevrolet's Tonawanda plant, discussion centered on the departure of Charles E. Sorensen from the Ford hierarchy.

Charlie Sorensen was news, and the official explanation at Dearborn of his exit as production chief of the Ford empire was far from satisfactory for rumor mongers. Headlines in one Detroit paper screamed: "Sorensen Fired".

Long ailing, the 62-year-old Danish-born production genius was sunning himself in Florida when the news broke. His simple explanation: "I am resigning from the Ford Motor Company after 39 years of continuous service... I am compelled to take a much needed rest..."

That Sorensen won his power at the expense of big Bill Knudsen, who went to Chevrolet to beat Ford production records, that Henry Ford paid him $200,000 annually, that he may have lost his power to a man who knows little about production, Ford personnel boss Harry Bennett, all those things are unimportant compared with the contributions he made to the science of automobile mass production.

A Realistic Man, Sorensen translated into actuality the idealistic production dreams of Henry Ford. He conceived the moving auto assembly line, dragging cars along the floor with a rope. Capping climax of this long career was the single-handed direction of converting more than two score Ford plants to handle a $5,000,000,000 armament production program, fulfillment of the promised bomber an hour at Willow Run.

"Cast Iron Charlie" (so-called because of his preference for casting over machining) will not have a single successor at Dearborn. It will take more than one man to fill his shoes.

● **Hudson:** Despite general cessation of new plant construction, expansion of factory facilities continues in motor row. Late last month Hudson got the green light from Uncle Sam, commenced work on enlarging and retooling a section of its Detroit plant with a $1,765,000 contract increase granted by the Defense Plant Corporation.

Since Hudson lost its big Centerline Naval Arsenal job to Westinghouse, the auto maker's facilities have been devoted exclusively to Army work. The only fact on the expansion program released to newsmen: It is related to a new, large airplane contract.

● **Buick:** Already one of the major aircraft engine producers, this GM division now is tooling to manufacture a new high priority cargo plane engine of the Pratt & Whitney Twin Row Wasp type.

A 14-cylinder radial unit developing 1,200 horsepower, the new engine is comparable in most parts with the "P & W" R-1830-43 engine being turned out by Buick for Liberator bombers. Production will be carried on in existing facilities in Flint, Michigan, and Melrose Park, Illinois. Many parts and sub-assemblies are to be produced on the same machines and assembly lines. Now near completion is installation of additional machines to accommodate the design changes.

Fifty per cent of fabrication is scheduled for the Buick Flint plants, with the balance of machining, final assembly and testing taking place in the Mel-

(Continued on following page)

LIBERTY Proves ONE Equals TWO

When You Use Liberty High Speed Grinding Attachments

Here is a machine tool which will DOUBLE the potential capacity of your surface grinders.

Model No. 90-31
Set at 90°, grinding a gage seat in a hard-to-get-at place. Can be set to any angle within 180°.

LIBERTY HIGH SPEED GRINDING ATTACHMENTS are precision built for intricate and hard-to-get-at precision grinding jobs.

Model No. 90-31
Sharpening broach with 5° clearance.

Model No. 90-31
Grinding hardened flats and blind slots in restricted working space.

Model No. 90-31
Grinding hardened work seat ordinarily hard to get at.

WRITE FOR FURTHER INFORMATION

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HARRON, RICKARD & McCONE CO.

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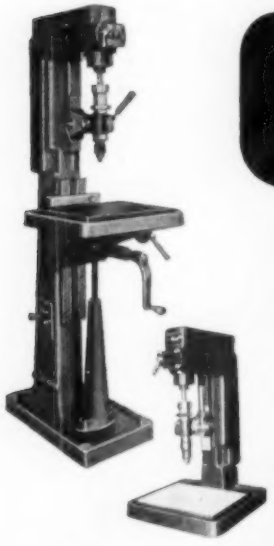
A HIGHLY DEVELOPED LINE...

Avey



MA 8—Eight speeds. 1200 to 12,000 R.P.M. Small work up to ⅜". Built-in motor. Bench and column types. 1 to 6 spindles.

Type B—No. 1, No. 2, No. 3 sizes. Hand feed drilling units. Hand feed tapping units. Power feed drilling units.

ONLY years of steady development can evolve the drilling equipment that is found in the Avey Line of Sensitive Drilling Machines.

The advances required in machining methods caused by the demands for greater output, necessitated more efficient drilling equipment. Avey Drilling Machines have steadily led the field.

Avey High Speed Sensitive Drilling Machines are built-in types and sizes to cope with varied needs. They are designed in capacities from the smallest drill gauge size to approximately 1¼ inches.

Being ball bearing throughout, they rate the highest speeds without vibration. This feature insures maintained accuracy.

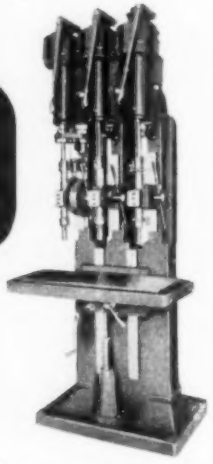
The Avey Catalog details the line of Avey Drilling Machines and Drilling Machine Accessories.

Avey Engineers will come to your aid in solving new and different drilling problems.

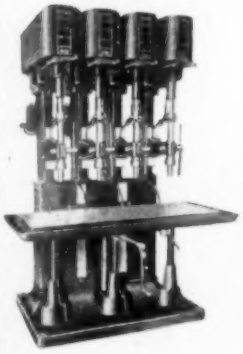
Individual Motors for each Spindle.

Single and Multiple Spindles.

AVEY
DRILLING MACHINE CO.
CINCINNATI · OHIO



MA 6—Six speeds. No. 2 and No. 3 sizes. Built-in motors.



Belted quick speed change machine. No. 2 size. Four speeds. Standard frame motors.

Avey DRILLING MACHINES
CINCINNATI · OHIO

INDUSTRIAL NEWS DIGEST

(Concluded from preceding page)

rose Park shops. No cutback in Bomber engine output was suggested. Buick has turned out more than 35,000 bomber engines to date.

● **Chevrolet:** Having already turned out more than 33,000 Pratt & Whitney 14-cylinder aircraft engines, GM's biggest division is undertaking the manufacture of a larger, more complicated "P & W" power plant. The new job, a refinement of the 18-cylinder R-2800, will supplement continued production of the smaller bomber engine.

Few parts for the 18-cylinder engine are interchangeable with those for earlier types, according to Chevrolet engineers. Tooling now is under way and production is expected to commence in October.

● **Mack:** Motor trucks aggregating 438,000,000 pounds gross weight have been delivered on government war contracts by the Mack-International Motor Truck Corporation.

This old-line producer's output, however, is not limited to standard carrying units. Mack supplies the armed forces with searchlight trucks, military buses, field dynamometers, aircraft parts, tank transmissions, tankers, crash trucks and other specially designed vehicles.

Present Mack war contracts call for the future delivery of trucks with a total of more than 150,000 tons carrying capacity.

● **Studebaker:** A seldom mentioned phase of auto industry war production has been spotlighted with news from South Bend that Studebaker's shipments of packaged truck parts have now reached a total of 900 tons a week.

These shipments are covered by four contracts:

Parts assigned to each multiple-drive truck produced by the company; parts for vehicles in their second year of service; parts for field service; and bulk parts in which a single order may cover tens of thousands of identical items.

● **Fisher Body:** A "secret" has been officially announced that everyone here has known for months. This GM division is producing a major part of the Army's new super bomber, the B-29.

Fisher is building major assemblies and parts required by three assembly plants currently engaged in the plane's production. Eight of the company's plants in Michigan and Ohio are contributing to the program.

This brings to four the number of plane programs to which the GM unit is a contributor. In addition to the new Superfortress job, Fisher is turning out major assemblies and parts for the B-25 Mitchell and is tooling to build a fighter plane.

Real news lies in the last program. Scene of the fighter job is Fisher's little "Willow Run" in Cleveland, originally scheduled to handle the big bomber job. The Superfortress, however, was shifted by the Army to other points and tooling now is under way in Cleveland to handle the all-General Motors superfighter.

Harden it for 10¢ with TOCCO

PROGRESSIVE *Kearney & Trecker Corp.*, Milwaukee, Wisc., reports the following savings by TOCCO hardening the above saddle clamp eccentric of their Milwaukee Milling Machine:

	FORMER METHOD	TOCCO
Heat treating	$ 0.721	$ 0.099
Straightening	0.752	0.000
Cleaning	0.100	0.000
Total Cost	$ 1.573	$ 0.099

Saving . . . $1.47 per piece

In addition to this saving of $1.47 per piece, TOCCO made possible a switch from alloy steel to S.A.E. 1045 steel, saving $0.110 in material cost per piece.

Total saving on each run of 1375 pieces for this one part is $2,172.50.

Kearney & Trecker hardens a total of 138 different parts on one "TOCCO JR." machine. Output of some parts has been increased as much as 500%.

Output of the saddle clamp eccentric was boosted 144%—from 41 to 100 pieces per hour!

Why not enlist TOCCO's experienced Engineers to help you obtain similar improvements for *your* production? New booklet, "Results with TOCCO", free on request.

THE OHIO CRANKSHAFT COMPANY • Cleveland 1, Ohio

TOCCO

HARDENING . . BRAZING

ANNEALING . . HEATING

★

Reduce Rejections INCREASE Profits SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT..

REDUCED REJECTIONS

- Smooth Finished Parts
- Bending Without Cracking
- Rivets Without Fracture

If you wrote your own specifications for *the ideal*, all purpose, open hearth carburizing STEEL, it would be . . . SPEED CASE!

"Rejections Eliminated"

After being machined at 235 S.F.P.M., the ends of the long part were bent as illustrated. The small part was machined at 220 S.F.P.M. and after being fitted over the ball part of the large piece, it is rolled over to make a swivel.

Speed Case X1515 replaced SAE 1112 and eliminated rejections entirely.

Estimated Savings per ton of Steel used $41.33.

BUY WAR BONDS

★ Write for *SPEED CASE* PRODUCTION RECORD BOOK. Actual shop records showing savings of 20 to 65%.

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PECKOVER'S LTD. Toronto, Canadian Distributor

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

INDUSTRIAL NEWS DIGEST

(Concluded from page 124)

INDUSTRIAL BUSINESS NOTES

INDUSTRY REPORTS

● News of expansions, services and activities

Expansion: As a result of mounting production and sales, according to Hans Mandel, president, The Wickman Corporation, Detroit, has doubled its shop facilities and office space. Wickman produces Swiss type automatics, grinders and machine tool attachments.

* *

Assignment: Of manufacturing rights for Meehanite castings to the Indian Hume Pipe Company of Wadala, Bombay, India, has been announced by The Meehanite Metal Corporation. Technical manager for the Corporation in India is W. H. Moore formerly of Chattanooga, Tenn.

* *

Up and Up: In '43 went production, sales, orders, taxes, and employment at Westinghouse Electric and Manufacturing Company, according to A. W. Robertson, chairman. Net sales and taxes increased 47 per cent and 52 per cent respectively, while employment jumped 83,000. New orders totaled more than $958 million, with unfilled orders standing at nearly $886 million at year's end.

* *

Increased Sales: Revenue was tempered somewhat by higher production costs for the 1943 fiscal year, reports Lukens Steel Company and subsidiaries —By-Products Steel Corporation and Lukenweld, Incorporated. While sales were up 13 per cent over '42 manufacturing costs were 19.5 per cent more than cost of products sold that year.

* *

New Branch: An office for distributing and servicing its product in Northern and Central California has been established by Kennametal, Incorporated. George Dolan, West Coast tool engineer, will be in charge of the branch.

* *

Occupation: Of its new one-story addition by the Kelley-Koett Manufacturing Company at Covington, Ky., is announced by A. H. Feibel, president. The space will be used for manufacturing, engineering, and office facilities.

Also announced by the company which manufactures X-Ray equipment is the opening of a new sales and service office in Cincinnati.

* *

Expanded Operations: Seventy-five year old Western Electric Company, Incorporated, has leased Area 2 of the Eau Claire Ordnance Plant at Eau Claire, Wisconsin, for additional manufacturing space. The acquisition augments the capacity of the company's Hawthorne Works in Chicago.

Formerly used for arms production, the new plant is well suited for Western Electric operations, requiring only moderate changes.

* *

Pratt & Whitney: Celebrating its 83rd anniversary, P & W Division, Niles-Bement-Pond, delivered a handsome 32-page "1943 War Year Book" to every employe, in or out of the armed forces. Highlighted are last year's top production, dozens of P & W employe activities. THE END

What will Users Want from POSTWAR Machine Tools?

4 BETTER FINISH

Among competing products, the one having the best machined finish almost always has the advantage—other things being nearly equal. It is a natural human trait to associate good finish with good quality.

And, experience with airplane engines has shown that finish is frequently important even when not visible. Airplane engine builders do much careful finishing on parts that are rarely seen . . because it has been found that finish is a powerful factor in eliminating fatigue cracks, hence fatigue failure.

By equipping machines with Vickers Hydromotive Controls, better finish can frequently be obtained without added cost and without extra operations. For example, smooth and uniform feeds can be secured regardless of variation in work resistance or hydraulic pressure. Vibration, backlash and override are usually easily eliminated . . . smooth reversals and constant cutting speeds on varying contours are also readily obtainable.

Better finish is only one of many advantages obtainable with Vickers Hydromotive Controls. Let Vickers Application Engineers discuss them with you.

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CONSTANT DELIVERY PUMPS

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PRESSURE CONTROLS

CAPITAL COMMUNIQUE

T. M. REG. BY THE BRAMSON PUBLISHING COMPANY

T. N. SANDIFER

Special dispatch from THE TOOL ENGINEER'S *Correspondent in the nation's capital.*

WASHINGTON

THE section of the Truman committee report dealing with the now notorious "sale" of cutting tools by the Army was sufficiently damning, but it remained for Senator Ferguson of the committee to furnish supplementary details which are almost beyond belief to the average citizen. Few of these details have reached the public.

Space does not permit recitation of more than a few of these statements on the broad phases of the deal, but there are aspects of the business which are of peculiar significance to men handling such equipment, and engaged in industries using or making such tools.

It will be recalled that this deal was the sale by Army officers of $1,721,136 worth of vital tools, including many special items, as junk, for a total of $36,924.64, or about 2 percent of their real value.

AMONG THOSE INVOLVED

The first apparent fact from Senator Ferguson's own account of the affair is that no real machine tool men were in charge of these tools, or had anything to say as to their disposal, unless one includes the WPB's Tools Division.

Check the list: One officer had been in an advertising agency; two others were Regular Army; another had been sales director for perfumes, among other activities; another one had been in newspaper work, but was said to have some die-casting experience. The officer who actually conducted the sale was listed by Senator Ferguson as a second lieutenant, who was said to have worked in an auto repair shop and as a drill-press operator. Another who was charged with prime responsibility in the matter, also a second lieutenant, had been in the upholstery business. One officer, of higher rank, was a mechanical engineer.

NO INVENTORIES, ONLY CONFUSION

Even if all had been tool experts they might have had difficulty in carrying out the order of the WPB Tool Division that the tools "be scrapped at once" without cataloging, shelving or sorting, because, as Senator Ferguson charges, "There was no inventory of these tools. No one at Washington, or at Wright Field, or at Detroit, had an inventory."

There was obviously confusion after the Tool Division sent its letter, which was afterwards claimed to have applied only to 264 separate tools. Actually scrapped, however, were said to have been 427,888 complete tools, and 19,142 semi-finished tools. No blueprints accompanied the instructions, hence, even experienced tool men, much less the men who actually carried out the order, might have had trouble.

The Studebaker Corporation, to whom some of the tools had been consigned originally by the War Department, had tried from June, 1941, when the contract requiring them was cancelled, to have them transferred to other shops where they might be needed. It was only in April, 1943, that any move was made by the authorities to do this, it has been stated, and the final disposition was made some time in late summer or early fall of 1943.

This is mentioned as pointing up the concern by private manufacturers now, with large inventories of such tools that will have to be cleared sometime, as to how the government intends to handle this problem, when it must be done wholesale.

Later, as might have been expected, it was found that all the time, the Services were going into the open market to buy such tools, while these were idle; about a month after the sale of the tools as junk, under the supervision of the inexperienced lieutenants, and others, it was discovered that a Chicago tool manufacturer had unfilled war orders, part of the huge national backlog of the time, for $1,250,000 of similar tools.

SIMILAR DEALS TO BE DISCLOSED?

This suggests another question. How much of the overhang of surplus tools that will be bothering manufacturers for years to come, can be charged up to as yet unrevealed instances of the same kind?

What some persons here are wondering is whether these sidelights on the proceedings at Detroit are a foretaste of what is to come. At the best, the story illustrates the pitfalls in the whole program from here out, when cutbacks and adjustments will be frequent, leading finally to industry-wide housecleaning, with the changeover to peacetime production. Reviewing the facts, the Truman committee reported this past month that the cutting tools sold as junk came from four companies, and said the committee flatly, "The tool store contained tools from four contractors" and furthermore, "There were no tool experts or experienced salesmen at the store."

"I TOLD YOU SO"

The War Department is not only under fire in this instance, however. Members of Congress, while noting the present situation have dug back in their memories to accuse Department officials of having bungled the machine tool situation at the start.

Specifically, some members recently have charged that according to their memories, when it appeared this country was about to be drawn into the war, proposals were made in Congress that industry tool up. When War Department authorities were consulted on this idea, the members now recall, they were opposed to acquiring machine tools and other industrial equipment at the time simply to have on hand and ready.

As a result of this shortsightedness, members now complain, much of the machine tool bottleneck of the early war production period resulted and had War Department representatives been sufficiently realistic it could have been avoided.

It has to be recognized that this is partly hind-sight now, but the facts as presented by these members certainly entitle them to say "I told you so."

OPA AMENDS PRICE SCALE

Meanwhile, the Office of Price Administration has had to amend its regulations governing the sale by government agencies of second-hand machine tools, machines and parts, to correct a situation arising from a previous regulation. The amendments in question became effective March 27.

When certain special pricing provisions were written for sale of such tools by the War and Navy Departments, and Defense Plant Corporation, it was assumed that the tools being sold would be fairly new, that is, only a few years in use. Later it was found that in some cases machine tools involved and extras, had been acquired as much as 17 years prior to the date of sale.

Accordingly a depreciation scale was

(Concluded on page 130)

FROM THE WASHINGTON VIEWPOINT . . . .

- Further revelations about the Army's peculiar sale of $1,721,136 worth of tools in the junk market. OPA finds it necessary to amend regulation to assure fair prices for second-hand equipment. Disposal of properties is generally following Baruch proposals.

- Smaller plants may get a break in connection with surplus materiel. Lend-Lease continues to account for large volume. Deliveries of industrial equipment to Russia loom large; India and Australia also factors.

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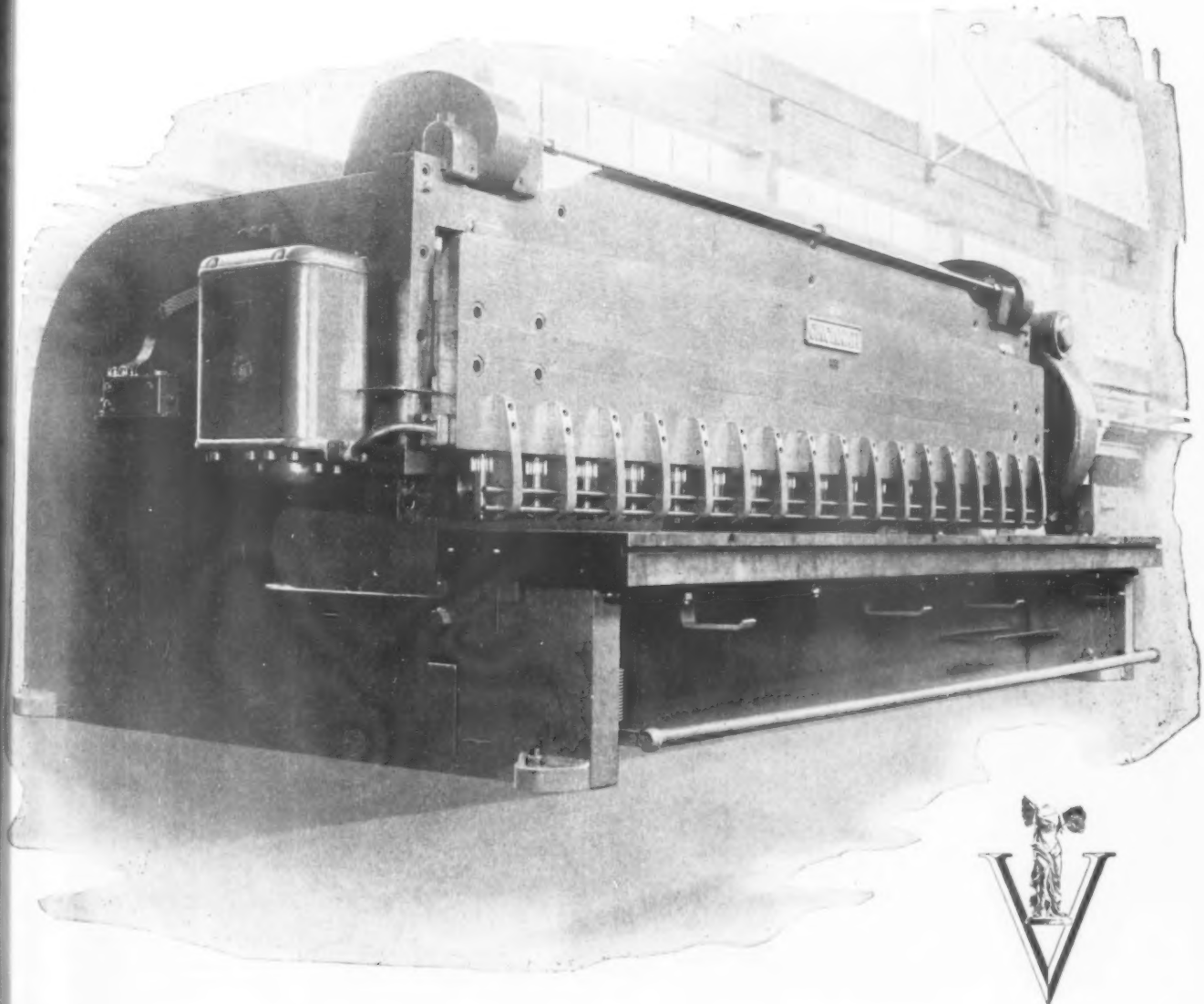
CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Clean Cut

Clean cut in appearance and clean cut in performance, powerful 100-Series Cincinnati Shears accurately cut 1¼" heavy plate up to 8 feet in length and 16 foot lengths of ½" plate.

Let our Engineering Department consult with you on your shearing problems. We suggest you write for our comprehensive Shear Catalog, No. S-4.



OPERATE SMALL MACHINES ?

THESE COOLANT PUMPS WERE DESIGNED PARTICULARLY FOR *You!*

MVBD — for mounting on outside of coolant tank or machine pedestal.

MVA — A submerged type to be mounted in sump or separate tank.

Though only about 16 inches high these pumps will bring you the same high efficiency in coolant flow as that delivered by the full sized counterparts. Powered with heavy duty, long hour, totally enclosed, ball-bearing motors.

Model MVBD requires no intake piping; intake is through a hole in mounting pad. Three outlets in pump body permit optional piping to right, left, or back into coolant sump through intake bracket.

Model MVA designed for machines with coolant sump provided in base or for mounting in a separate coolant tank. Chips that will pass through grille (at bottom of pump) will readily pass through the pump without causing damage. Pioneer Pump & Mfg. Co., 19645 John R. St., Detroit 3, Michigan.

PIONEER *Pumps*

HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

—CAPITAL COMMUNIQUE—

(Concluded from page 128)

provided, and now it has been discovered that this depreciation operates in some sales to lower the price to zero, or at best, only a nominal sum. Thus OPA is restoring certain measures to insure that sales by these government agencies of tools and extras, which were acquired for purpose of rental originally, shall bring a fair price.

Only since the Baruch report has the country gained some idea of the proportions of the Government's problem in disposal of war-accumulated properties of all kinds. The Surplus Property Administrator, Clayton Williams, is following generally the broad outlines of the Baruch plan under which all types of industrial property, and producer goods, would be handled by a consolidation of certain Reconstruction Finance Corporation subsidiaries.

Outright sales are preferable, under the plan, but some leeway was recommended for exchanges, leases, and credit sales. Also, it was recommended that surpluses should be offered in lots small enough to permit small, as well as large business organizations to obtain them. As projected in the report, some $5,000,000,000 of government plants are convertible for peacetime.

LEND-LEASE IN BIG FIGURES

And, unlike the case of the Detroit tool sale, where the Army public relations staff was actually charged with advising against any publicity on the sale plan, the present program contemplates, as one official put it, "everything being done in a goldfish bowl" so far as public information is involved.

The indications are that a considerable amount of equipment is going to be installed or reserved, for Government stand-by use, in case of emergency. And of course, the shape of the peace to come will determine the outlet for a lot more.

In this connection the latest report on Lend-Lease indicates that machinery and plant equipment, including machine tools, continues as a heavy part of such aid abroad.

In the case of the Soviet, to the end of 1944, besides astronomical numbers of weapons, industrial equipment totaling $400,000,000 in value, which included machine tools and machinery for metal fabricating in Russia, have been furnished by this country. One item alone included used and new machinery to equip a complete tire factory. Machine tools for plane production have been furnished the United Kingdom, in an unstated amount, as well as for other weapons.

The report, giving full credit to British industrial effectiveness, nevertheless said the British record could not have been attained without machine tools from this country and other industrial equipment and component parts. Similarly, India is becoming industrially active in supplying weapons for the war, and presumably some industries will remain active after the war. American machine tools, in an unreported amount, figure in that land's efforts.

Our machine tools are a factor in Australian production. Industrial materials and products constituted, up to the end of the year, better than 20 percent of all this country's Lend-Lease shipped abroad. THE END

IN thousands of grinding, burring and filing operations the hand that rocked the cradle is efficiently speeding up war production with ARO Pneumatic Grinders.

Engineered to deliver more power than average tools of their size ARO Grinders and other ARO Pneumatic Tools get *more work done* ...with *less fatigue!*

Ruggedly constructed—simple in design—lightweight and stall-proof, ARO Pneumatic Tools, in addition to grinding, are ideal for small tool operations such as drilling, screw-driving, nut-setting and many others. Send for complete catalog. The ARO Equipment Corporation, Bryan, O

How to Step Up Production

50% to 150%

With wear resistance far higher than high-speed steel; shock resistance higher than tungsten carbide; greater toughness at dull red heat than when cold—Speedaloy cuts best at speeds 50% to 150% higher than high-speed steel.

This solid cast non-ferrous alloy, composed mainly of cobalt, tungsten and chromium, withstands heat up to 1450 F and gives long cutting life between grinds. Resists abrasion, corrosion and most acids. Non-magnetic. Low friction coefficient. Exceptionally effective on metals that generate high heat—stainless steel, manganese steel, tough alloy steels, etc.

Speed your production—cut operating costs—save time losses—by equipping your machines with Speedaloy tools. Available in standard solid blanks — squares, flats, tubes, work rests, milling cutter blades—also tipped blanks . . . Write today for FREE Speedaloy Bulletin giving sizes and full information.

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TOOL BITS • TIPPED TOOLS

Good chucks
MEAN GOOD WORK

Good Chuck maintenance means BETTER work...

A NEW Cushman chuck comes to you as a fine precision tool capable of doing its part in meeting the most exacting tolerance requirements in your finished product. But like all fine tools it will do its best job over a long service life if it receives proper care. It should be properly lubricated at regular intervals . . . bearing surfaces should be kept free from abrasive particles . . . mounting on the spindle should be accurate . . . and it should not be overloaded. Take good care of your Cushman Chucks. They are tools . . . and tools are weapons . . . treat 'em right. The Cushman Chuck Company, Hartford 1, Connecticut.

Send for these "Chuck Check" maintenance cards today.

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CUSHMAN CHUCKS

A Balancing Type Wheel Sleeve for Norton 10" and 12" Surface Grinders

Gives Better Surface Finishes

THE balancing type wheel sleeve now available for Norton 10" and 12" Surface Grinders, while no panacea for poor spindle bearings or careless truing, may be of material assistance in obtaining better surface finishes.

Developed by Norton Engineering Service, these wheel sleeves give a quick, easy and assured method of balancing the larger sizes of surface grinder wheels. With the machine in acceptable mechanical condition, such a sleeve should give that added degree of refinement to break up troublesome pattern conditions.

Again we say that a balancing wheel sleeve is no cure-all but may give you just that extra refinement in grinding practice needed to produce those "aircraft finishes" so much in demand today.

NORTON COMPANY
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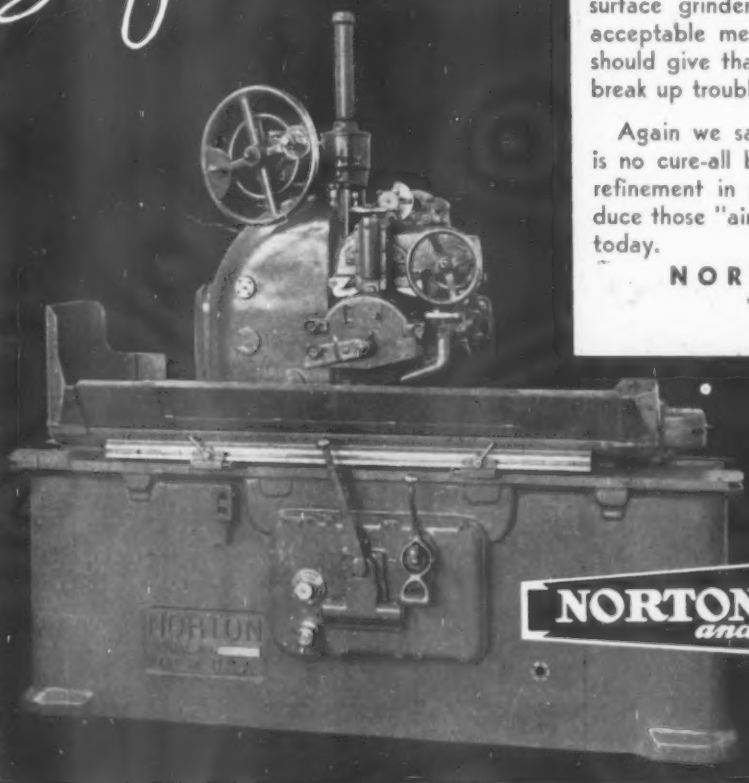

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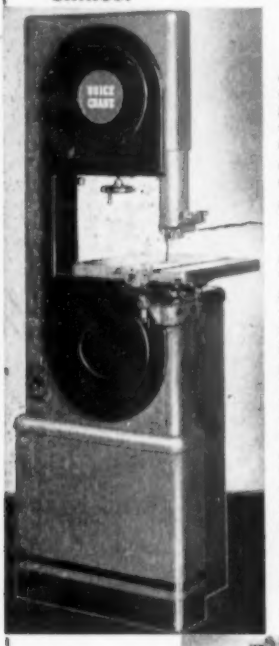
EVERY DOLLAR

Invested in Boice-Crane Power Tools Does The Work of Two Spent on Oversize Machines.



BOICE-CRANE 14" BAND SAW

for fast, free cutting of metal, wood, plastic and paper up to 8⅝" thick and 27" diameter. Fine work reduces sanding costs on end cuts.

Quiet. Vibrationless.

The single knob control adjustable guide handles blades from ⅛" to ¾".

Top rated by State Safety Commissions.

Wheel guard must be closed to operate.

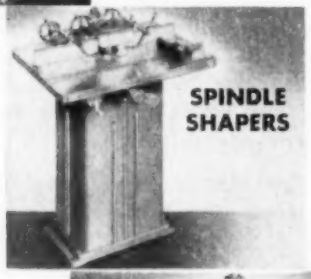
Telescoping blade guard held by friction when lock handle is released.

Heavy duty gears transmit up to 1 H.P. at lowest speed with full safety. All gears run in oil.

15"x15½" table tilts 45° to right, 10° to left; convenient scale indicating degree of tilt. Two large trunnions prevent sag under heavy cuts.

Single and 8-speed bench and floor models. All moving parts, including motor, on floor models fully enclosed and dust-sealed.

A battery of 6 to 10 Boice-Crane Saws costs no more than some single big size machines.



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ALCO

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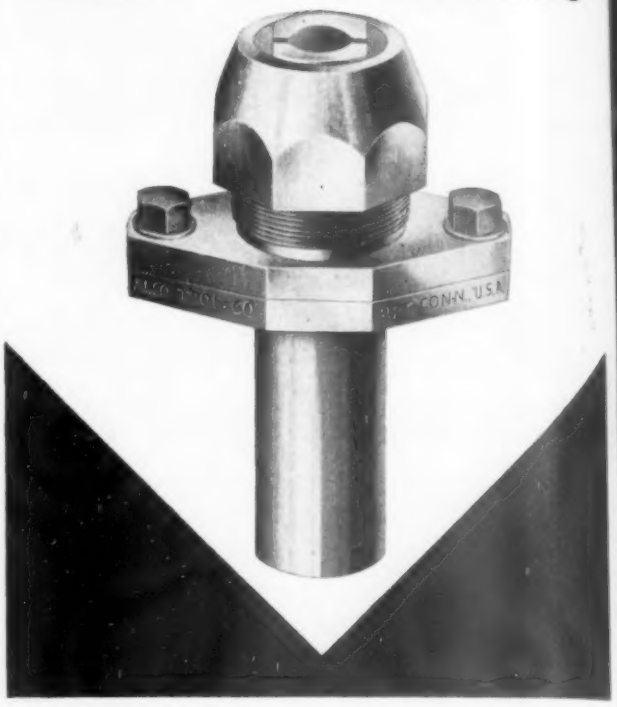

COMPLETE RANGE OF SIZES FOR DRILLS FROM 1/32" TO 1"

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ALCO Drill Chucks fit all screw machines . . . Drills are held securely without the use of bushings . . . Full floating feature of the ALCO holder insures concentric drilling even on your old machines . . . Each ALCO Drill Chuck has a wide range of adjustability so that one chuck will do the work of several . . . Produce perfect work faster.

Don't overload your tool room with rush orders for drill bushings — Use ALCO Drill Chucks which hold drills securely WITHOUT BUSHINGS. Modernize all your machines now with ALCO Tool Holders.

Send for Catalog No. 4 showing complete line of ALCO Efficient Tools.

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THE ALCO TOOL CO., 453 BIRDSEYE ST., BRIDGEPORT, CONN.
Chicago Office: 6219 S. Kenwood Ave., Telephone: Hyde Park 6807
Detroit Office: 908 Stephenson Bldg.

Save valuable tools!

Send for this FREE BOOK

It gives valuable information about repairing broken BROACHES, MILLING CUTTERS, FORMING TOOLS, PUNCHES, DIES, DRILLS, TAPS, CIRCULAR SAWS, BAND SAWS and other cutting tools, with the Low Temperature Brazing Alloy EASY-FLO.

It's a method of repairing tools that can be used in *any* shop — one that is sweeping through industry because it is so simple and economical.

All the information you need to put this reliable method to work in your own shop —also numerous illustrations of actual tool repairs and details of how each job is done.

WRITE FOR YOUR COPY TODAY. Ask for the "EASY-FLO TOOL REPAIR BULLETIN—No. 14".

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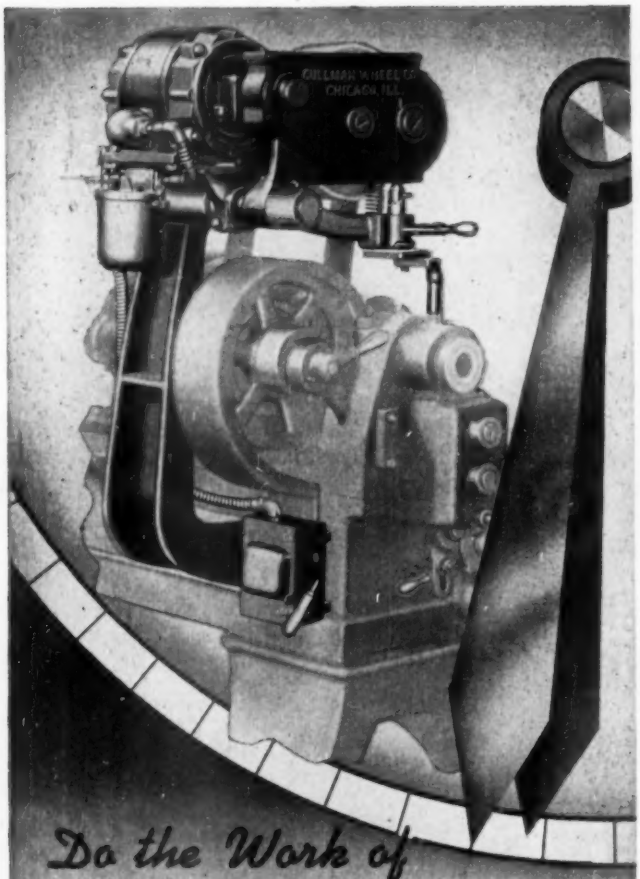

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With the ever-increasing demand for faster delivery it is vitally important to get maximum production from every machine and man-hour.

Cullman Drives will modernize shaft and belt driven lathes, screw machines, shapers, and similar equipment to give an increased output of more than 25%.

Cullman Drives give individual machine control, have greater flexibility, and are safer in operation than overhead line shaft drives. They permit the utmost in efficient arrangement for work flow and lighting.

Cullman Drives are sturdy and built for long life. They operate with belt-drive smoothness. They are easy to install and economical to buy. They are built for motors from ¼ to 15 H.P. Prompt delivery can be made on most sizes.

Write for full information on Cullman Drives and the 60 day trial plan.

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This is no time to have men pawing over the scrap pile for makeshift setting-up materials. At any time it's bad shop practice when permanent efficient time saving ARMSTRONG SETTING-UP TOOLS can be picked up from the nearest Mill Supply house. ARMSTRONG Planer, Jacks, Bracing Jacks, Strap Clamps and T-Slot Bolts cut setting-up time to a fraction on Planers, Shapers, Boring Mills, Milling Machines and other machine tools. They assure rigid set-ups, more accurate work and prevent accidents and spoilage. They usually pay for themselves in a single job and give years and years of service. A complete line.

Write for Catalog C-39a

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"The Tool Holder People"
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Investigate! THE NEW LANDIS TOOL No. 12 CENTERLESS GRINDER NOW

STUDY THESE OUTSTANDING FEATURES OF DESIGN

★ Regulating wheel base completely self-contained. Drive through multiple V belts from adjustable speed motor which gives infinite number of regulating wheel speeds by turning one control knob and with no interruption of grinding cycle.

★ Regulating wheel base carried on hydraulically operated cross slide which permits wheel dressing to be accomplished more quickly and accurately. Dresser so mounted that path of contact between regulating wheel and diamond is the same as path of contact between regulating wheel and work.

★ Work rest blades may be quickly and accurately aligned because of hydraulically traversed regulating wheel base.

★ Easy alignment of the regulating wheel with the grinding wheel because of cross movement to regulating wheel base.

★ A swiveling regulating wheel base intended for grinding of tapers. Face of regulating wheel always parallel with its axis and a more uniform peripheral speed is imparted to work. When changing over from one taper to another, from a straight face to a taper surface or vice versa, there is no expensive wheel loss due to unnecessary truing of regulating wheel.

★ Work rest mounted directly and solidly on machine bed. Elevating screws under each end of work rest blade make set-up easier and quicker for thrufeed grinding operations.

★ Grinding wheel base completely self-contained with drive to spindle through multiple V belts. Exclusive Landis Microsphere wheel spindle bearings used for both grinding wheel spindle and regulating wheel spindle, thereby making possible close operating clearance and positive clearance adjustment.

★ Centralized main control grouping includes master start button, master stop button, wheel dresser controls and three-stage motor selector switch for set-up, grinding and dressing.

★ Regulating wheel speed automatically increases with motor selector switch at dressing stage and automatically slows down to grinding speed with return of motor selector switch to grinding stage.

441

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WAYNESBORO, PENNSYLVANIA
MANUFACTURERS OF PRECISION GRINDERS SINCE 1889

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An Aluminum Alloy—Non-Heat Treated. The perfected metal that surpasses all others for a wide variety of machining operations. Non-corrosive—Easy on machine tools—Holds threads without stripping. Its light weight reduces table and machine loads and increases tooling accuracy. 5 years of proven superiority in hundreds of plants. OH 38 is an exclusive Hedstrom product.

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THE NEW SUPER STANDARD

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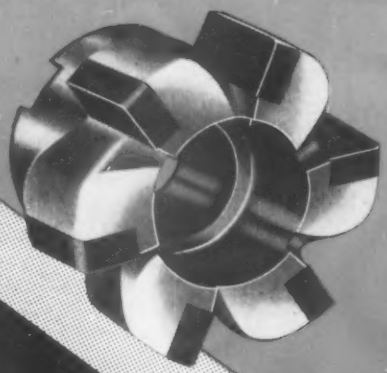
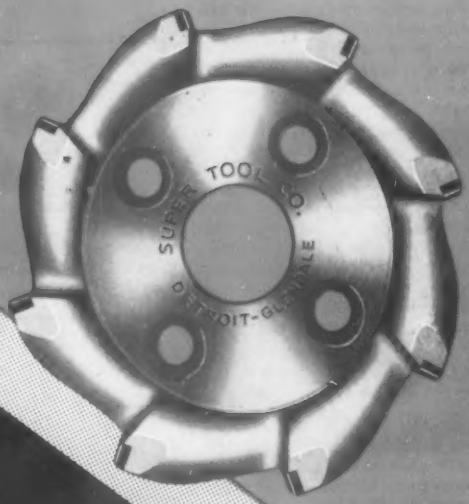
SHELL END MILLS AND FACE MILLS!





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Write TODAY for literature, prices and complete details of these Super quality, economical Carbide Tipped Cutters.

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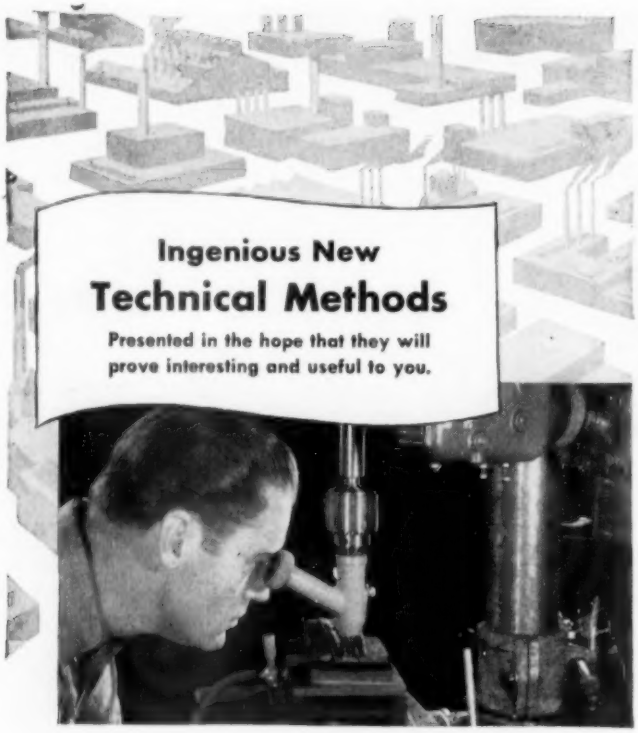


Center Scope Brings Optical Precision to Machine Shop Operations

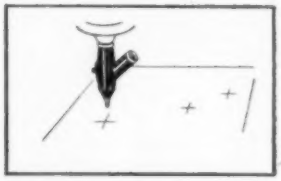
The Center Scope is an optical centering and locating tool that can be easily and quickly used on any machine to center work reference lines to a spindle axis. It permits accuracy to a degree never before obtainable, as the optical beam or line of sight is absolutely inflexible and cannot be distorted.

The Center Scope's easy accuracy eliminates many human errors, as the operator can see just what the cutting tool will do before it is actually fed into the work. It increases production, improves efficiency and prevents spoilage. There is no pressure on the work piece nor is it subject to wear or changes in temperature—for the Center Scope never touches the layout.

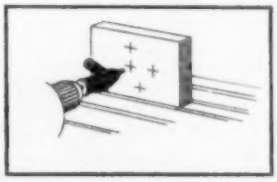
The Center Scope enables the operator to easily and quickly locate edges to a spindle axis, set-up faster and compensate for run-out. It saves vital hours in checking, inspecting and measuring when mechanical methods and tools are impossible to use. Its 45 x magnification allows operator to see ".001" and requires no technical knowledge or training to operate.

While there is nothing particularly new or ingenious about Wrigley's Spearmint gum, it is proving useful to millions of people in many new ways. Workers in war plants everywhere have found it helps keep them alert and relieves nervous tension and dry mouth while they are on the job.

You can get complete information from the Center Scope Instrument Company, 351 South LaBrea Ave., Los Angeles, Calif., or Kearney & Trecker Products Corporation, Milwaukee, Wisconsin.



ON A VERTICAL MILL—locating and centering height gauge or size block layouts. Permits jig borer accuracy on more machines.

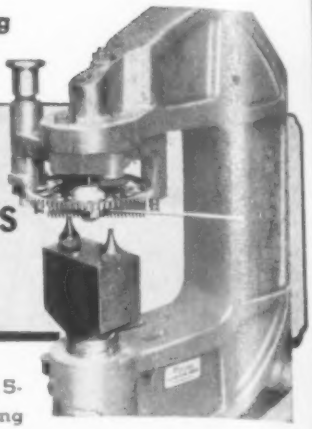


ON A HORIZONTAL MILL—the ability to center a layout, edge block or rotary table plug while spindle is running. Permits quick and easy set-up for high precision work.

Y-110

For Better Riveting
FASTER...

use a
HANNA
RIVETING PRESS
Tailored to YOUR Job!

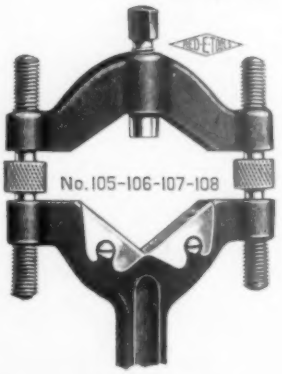


Here is a close-up of a 15-ton Hanna Rapid Riveting Press tooled for duplex riveting of a gear assembly—it's built to give top production on this specific operation. It is one example of the 500 styles and sizes Hanna has produced, both pneumatic and hydraulic, to handle rivets from 3/16" to 1-1/2" in diameter.

Whatever your riveting problem may be, take advantage of more than 40 years experience that Hanna has in the design and application of riveting presses. Send a description of your work with blue prints—or a sample if you can. Write for Catalog 232.

HANNA ENGINEERING WORKS
1765 ELSTON AVENUE • CHICAGO 22, ILLINOIS
RIVETERS • CYLINDERS • VALVES • AIR HOISTS

Adjustable for Different Diameters



This straight tail grinder dog

is especially desirable for use on cylindrical grinders of various makes, comes in four sizes and thus will accommodate any diameter from 1/4 inch to 6 inches. There is but one screw to be operated and work can be handled as quickly as with any single screw dog. They have brass faces and brass-tipped set screws.

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THE READY TOOL COMPANY
585 IRANISTAN AVE.
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Quick Change FLOATING HOLDER Combination Tool

• A new combination floating holder and magic quick change chuck—plus a simple, fast-locking device which makes possible a concentric, rigid drive or a full float by simply raising or lowering a collar while the machine spindle is in motion.

Write for standard sizes and further details.

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1901 SOUTH ROCKWELL STREET • CHICAGO, U. S. A.

NOPAK Model R 2-, 3- and 4-way Foot Valve with Spring Treadle Return.

NOPAK Foot Valves FREE Both Hands

Foot control of pneumatic or hydraulic machine movements can be vital factors in improving the efficiency, productivity and sales appeal of the machines you build.

An outstanding advantage of foot control valves on many machines is the fact that they leave operators' hands free for other tasks, thereby reducing fatigue and nervous tension.

NOPAK 2-, 3- and 4-way Foot Valves are built in Spring Return, Ratchet and Double-Treadle Types. They afford various operating cycles for the control of single and double acting air cylinders or low-pressure hydraulic cylinders employing either oil or water.

For complete Technical Data, write for Bulletin 86.

GALLAND-HENNING MFG. CO.
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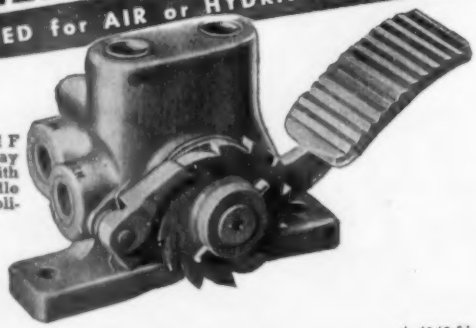
NOPAK VALVES and CYLINDERS
DESIGNED for AIR or HYDRAULIC SERVICE



NOPAK Model F 2-, 3- and 4-way Foot Valve with Ratchet-Treadle for "hold" applications.

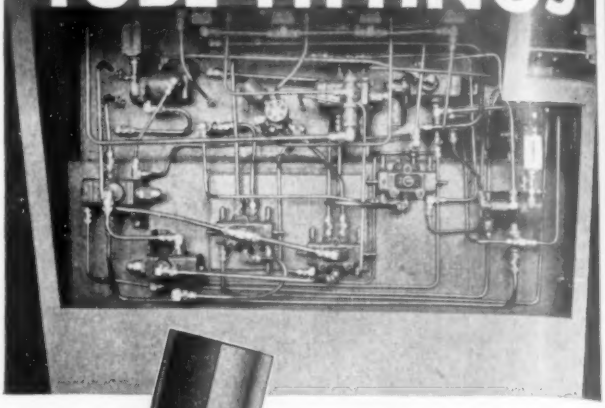
A 4342-½A

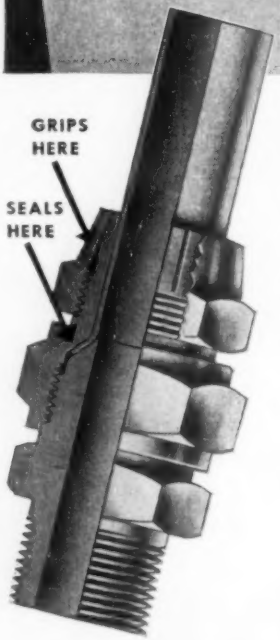
NO THREADING, WELDING OR SOLDERING WITH

COLLET GRIP

Seals as it grips

TUBE FITTINGS





A SAFE, DEPENDABLE AND EASILY INSTALLED FITTING

The ease with which COLLET GRIP Tube Fittings can be installed results in a big saving of time and service costs. To assemble or disassemble it is only necessary to tighten or loosen the compression nut, thereby permitting the collet nut to turn freely on the tube. This simplicity of design permits quick, easy installation of short lengths of tubing in close quarters—without bending the tube. COLLET GRIP fittings seal as they grip, providing connections as strong as the tubing itself—without threading, welding or soldering.

COTNER-WILKINSON COMPANY
Division of Logansport Machine Co., Inc.
LOGANSPORT • INDIANA

Fittings shown here are Double Nut design; also made in Single Nut design, simplified for close work. Each design in 5 standard shapes.

COLLET GRIP

SEND TODAY FOR CATALOG No. 43

Contains complete data on all standard fittings for tube sizes ranging from ¼" to 2"

Precision Roughing

A POST-WAR OPPORTUNITY
Worth Investigating Now!

ALL DONE ON A SINGLE HEALD BORE-MATIC!

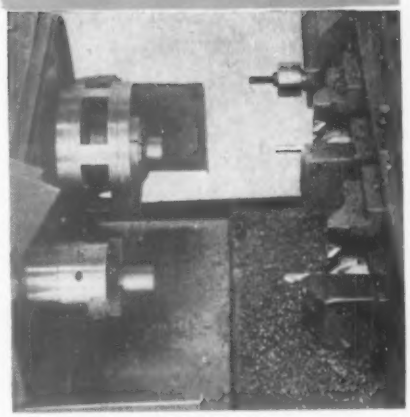
A NEW SLANT—a time and cost-saving one—for those engaged in post-war planning is this . . .

perform secondary operations, plus final finishing, on one machine . . . The Heald Bore-matic.

Because it is a precision machine with vibrationless operation inherent in its design, use of the Bore-matic for roughing as well as finishing operations on many types of work is entirely practical. Many times, one cut, from either forging or casting, will do the job successfully.

As plus values, precision roughing on Bore-matics is characterized by better finish, improved accuracy and longer tool life. Ideal surfaces, too, are produced—both with respect to alignment and stock distribution—for final finishing also done on Heald Bore-matics.

To plan your better post-war products; to lower costs; to keep a jump ahead of competition; to get dual use from each machine . . . get in touch with Precision Headquarters, where "thinking it out, pays out." The Heald Machine Co., Worcester, Mass.



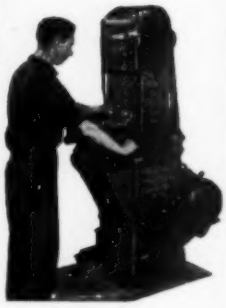
This automotive gear, except for cutting teeth, is completely finished from the rough on the Heald Bore-matic. Gears are rough and finish turned, drilled and finish bored, rough and finish faced, and chamfered on both outside and inside diameters, with good accuracy and finish.

HEALD *for more Precision . . . Faster!*

Internal and Surface Grinding Machines • Bore-matic Precision Finishing Machines

THIS BOOK Will Help You

. . . Slash costs and time on many SURFACING OPERATIONS



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Abrasive-Belt SURFACERS

are taking over many tasks formerly assigned to millers, grinders, shapers, lathes—and turning out the work faster—5 to 25 times faster—WITH SUPERIOR FINISH.

Wet-Belt Surfacing works an entire area, as large as 9"x17", with one presentation to the belt. Final finish is produced while taking the cut. Wet-Belt Surfacing is a precision method—tolerances of .0005" can be met by even inexperienced operators. It eliminates heat, discoloring, dust, distortion, flow, chipping. It works on any material; handles most jobs free-hand. Jigs, whenever they're required, are the simplest design. Set up time greatly reduced.

LEARN MORE ABOUT IT! Send today for our new booklet, which is virtually a treatise on one of the biggest machining aids to come out in years.

Porter Cable Machine Co.
1610-4 N. Salina St., Syracuse, N. Y.

Please send me a copy of "A New Precision Machining Method."

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HOW MANY CARBIDE BITS WILL A SUPER-CUT DIAMOND WHEEL GRIND?

Frankly, we don't know. One case is reported where a single Super-Cut Diamond Wheel, operating under careful supervision, ground over 22,000 carbide chip breaker tools of various sizes. And cases of ten to fifteen thousand carbide tools ground with one and the same Super-Cut Wheel are common.

We DO know that Super-Cut Diamond Wheels will speedily ***and materially*** lower your grinding costs to the minimum! We'll gladly prove this to your satisfaction in your plant on your work!

Super-Cut Diamond Wheels are bonded by a closely guarded, secret process used exclusively by Industrial Abrasives, Inc. The cutting section of each Super-Cut Wheel is comprised of layer upon layer of evenly distributed diamonds, each firmly imbedded in metal. As one layer slowly wears away another non-glazing cutting surface is exposed.

For faster, finer grinding and finishing, specify Super-Cut Diamond Wheels, now available for immediate delivery. Full particulars will be sent at once if you address—

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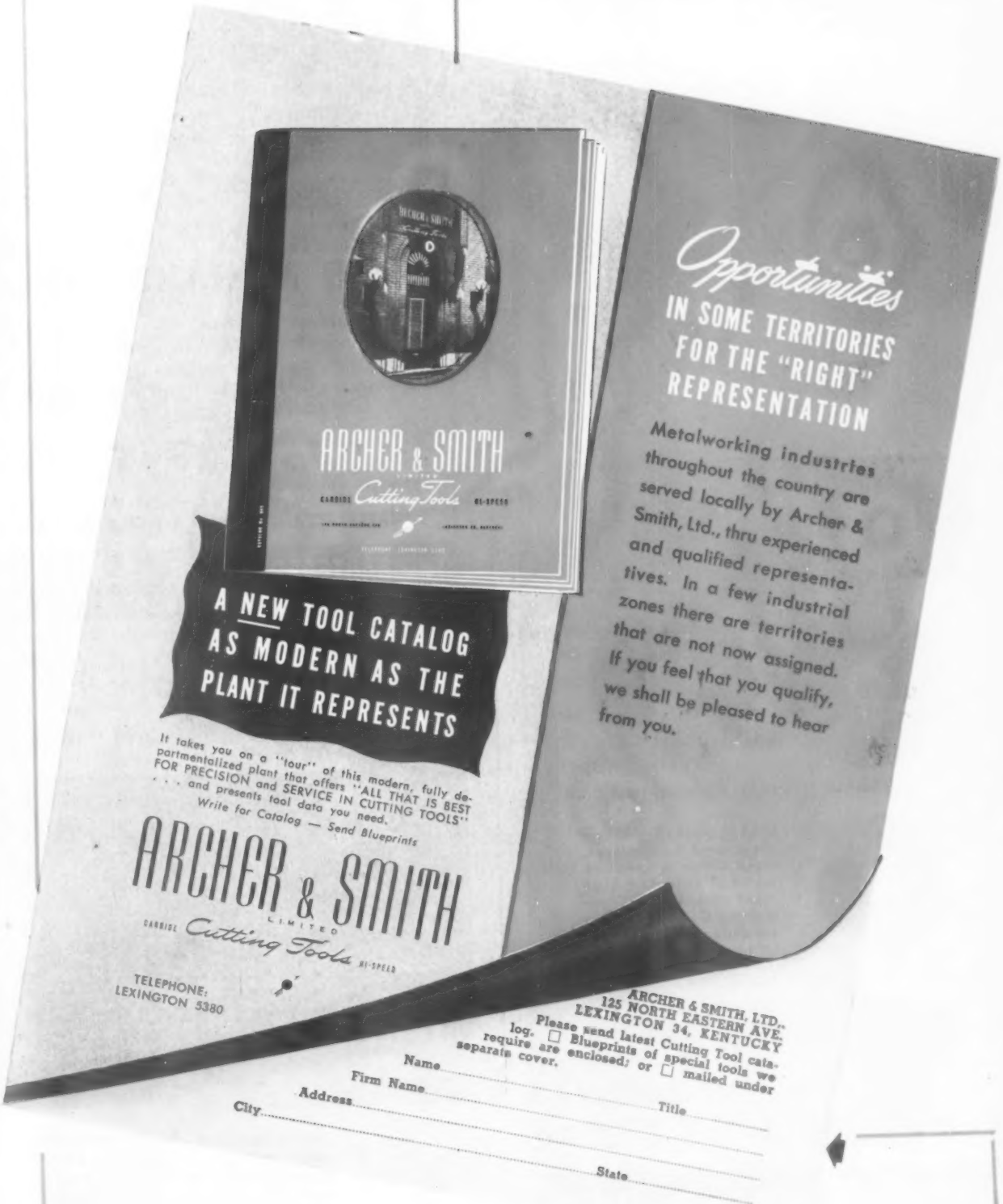
3724 West 38th Street—Dept. B-4—Chicago 32, Ill.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It takes you on a "tour" of this modern, fully departmentalized plant that offers "ALL THAT IS BEST FOR PRECISION and SERVICE IN CUTTING TOOLS" . . . and presents tool data you need.
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Metalworking industries throughout the country are served locally by Archer & Smith, Ltd., thru experienced and qualified representatives. In a few industrial zones there are territories that are not now assigned. If you feel that you qualify, we shall be pleased to hear from you.
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Please send latest Cutting Tool catalog. ☐ Blueprints of special tools we require are enclosed; or ☐ mailed under separate cover.
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CIRCLE ®

SCREW SLOTTING SAWS

2¼" diameter

2¾" diameter

1¾" diameter

Used by most of America's larger screw manufacturers, these Circle R saws are made of selected high speed steel. Like all Circular Metal Cutting Tools they are designed by specialists to successfully accomplish the most exacting operations.

Complete stocks of these sizes are available.

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For detailed information on these and other Circular Saws send for Catalog K. NOW!

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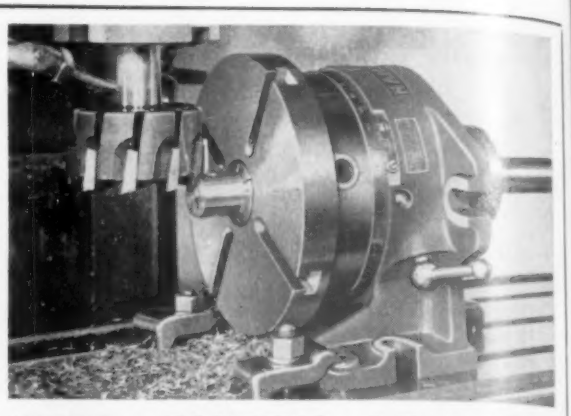

THE SUPER-SPACER FOR MILLING JOBS

Illustrated above is the application of the Hartford Super-Spacer for vertical milling of bar stock. A great variety of machining jobs can be done when the base is mounted with a Face-plate and Draw-in Collet Combination.

With available attachments and fixtures, this spacing device is easily and quickly set up for a large number of milling operations.

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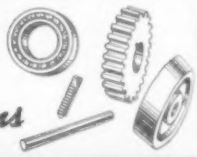
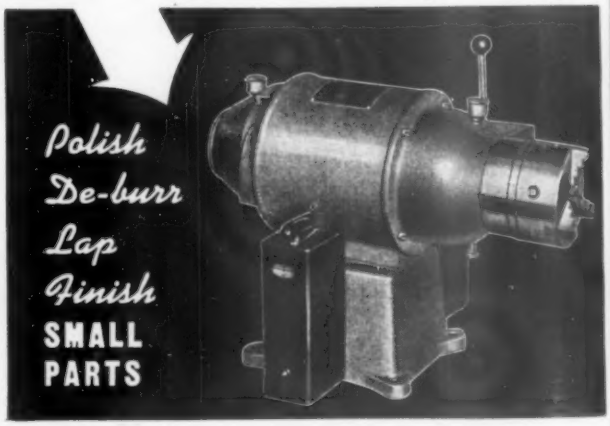
THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

SPEED LATHES

for Secondary Operations





Schauer Ideal Speed Lathes insure finer quality, greater accuracy and uniformity, coupled with increased output and lower cost. A size and type for every finishing purpose. State YOUR finishing problem. Write for Catalog 440.

SCHAUER MACHINE COMPANY
ORIGINATORS OF TODAY'S SPEED LATHES
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Prelude TO A PERFECT FINISH

CHICAGO

MOUNTED WHEELS AND SMALL GRINDING WHEELS

A complete range of styles, grains and sizes up to 3" in diameter to give you a perfect finish on every job.

PROMPT DELIVERY

Specialization—with full W P B approval—on sizes 3" in diameter and under, means no waiting for Chicago Grinding or Mounted Wheels. Let us take care of your present and post-war requirements.

FREE ENGINEERING ANALYSIS

If you have a grinding job that presents a problem because of the nature of material, tricky shape or other reason, tell us about it. Our experts will go into a huddle and give you the benefit of our long experience making millions of custom built wheels for every conceivable operation.

YES, YOU CAN FINISH IT BETTER WITH A CHICAGO WHEEL

Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Abrasive Industry.

ARMY NAVY

MOUNTED WHEELS

SMALL GRINDING WHEELS

Just as the prelude to a new world is better tools of war, so the prelude to a perfect finish is better grinding wheels.

Today's standards of finishes are far and beyond those of yesterday. To acquire them without sacrifice of production time is a goal which everyone seeks.

Finish must now be measured in micro inches. That's where the new Chicago FV BOND Wheels excel. They give a precision smoothness so intensified that it passes any surface analyzer test, in many cases eliminating hand lapping and auxiliary finishing operations.

HERE'S WHAT MAKES CHICAGO WHEELS CLICK—

A—Sensational new FV BOND. Result of research and experiment on hundreds of aircraft jobs.

B—No sacrifice of cutting time or wheel life.

FV BOND is available in all types of Chicago Mounted and Small Grinding Wheels—in all abrasives, grain and grade combinations.

TEST WHEEL FREE—To prove their superiority in your own shop, send for a Chicago Wheel made with FV BOND. Give us details of the job, material you want to finish and we'll do the rest.

Write for Catalog and interesting Engineering Survey Form

CHICAGO WHEEL & MFG. CO.

1101 West Monroe Street Dept. TE Chicago 7, Ill.

Send Catalog and Survey Form. Interested in
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☐ Mounted Wheels
☐ Send Test Wheel
Size _____

TE-4

NAME _____

ADDRESS _____

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New Catalog

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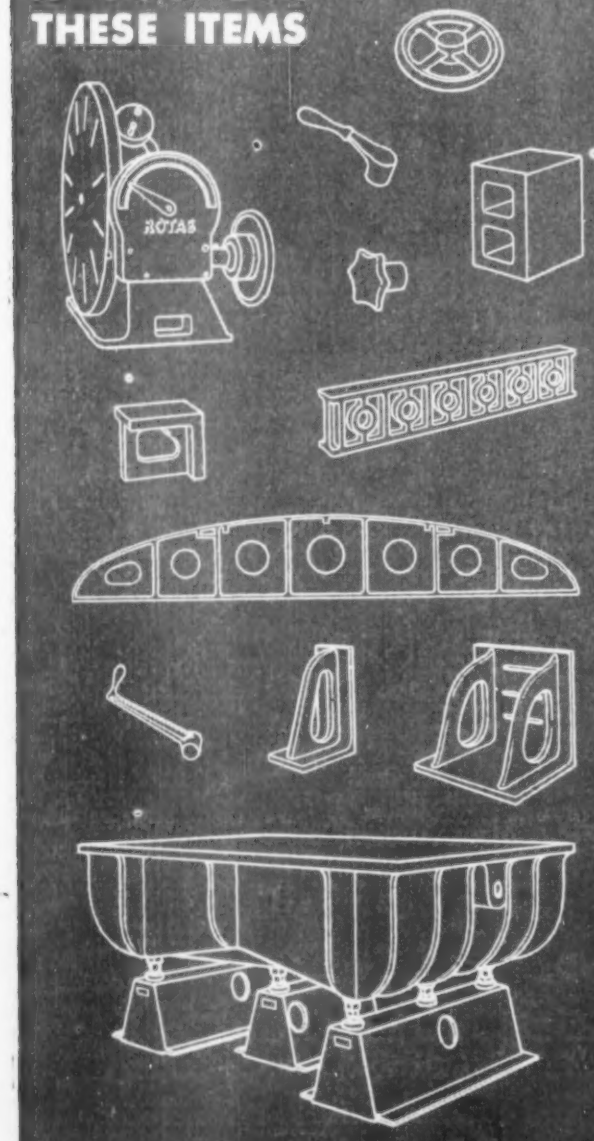

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6775 E. McNichols Road • Detroit 12, Mich.

PRODUCTO Master & Standard DIE SETS

delivered promptly

Whether your need is in the East or the West, we can give you complete, quick service on Producto equipment.

Producto Die Sets are made in a wide variety of designs to meet the exacting demands of present day high production. There is one to fit exactly the die construction best suited to your stamping needs.

Write for Catalog No. 9

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Rubber gives RESILIENCY—relative softness that controls and "cushions". Rubber-cushioned BRIGHTBOY applies this resiliency—combines rubber and abrasive—for close-tolerance

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Ask your dealer for prices and Applications Data. Ask Brightboy field representatives for our Service Department about saving time—improving quality—in your abrasive finishing.

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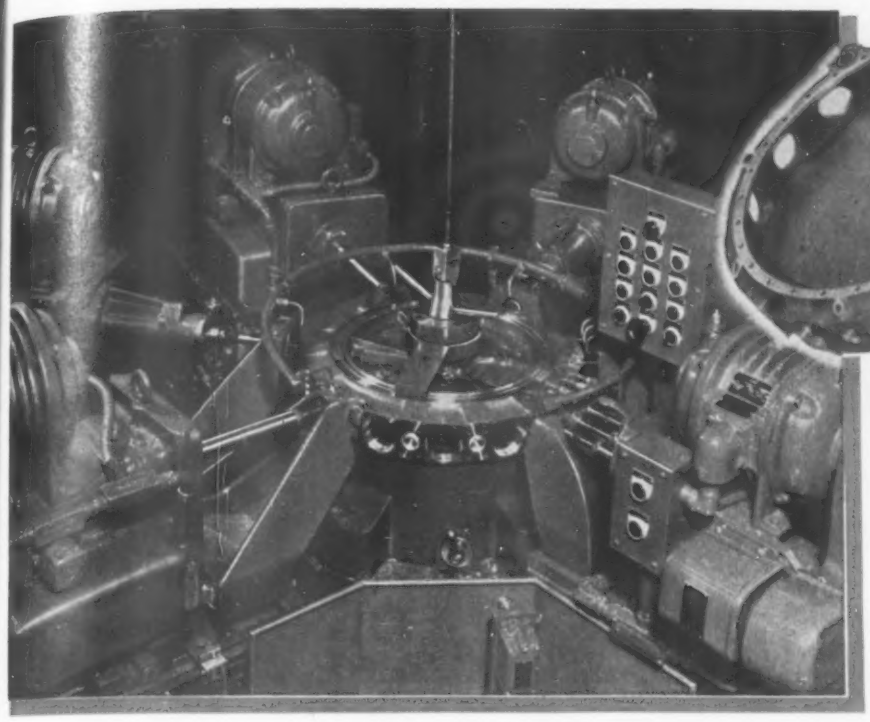
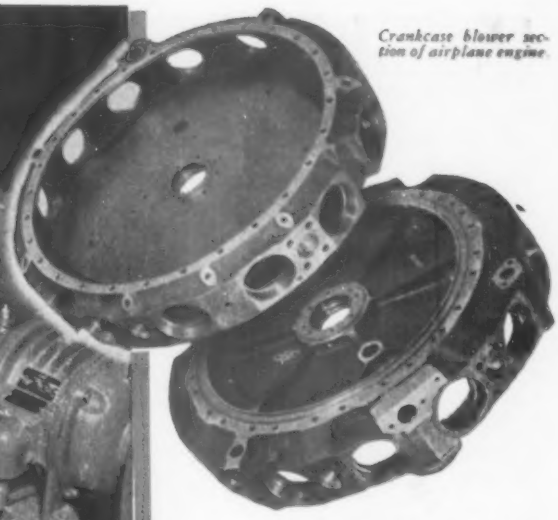
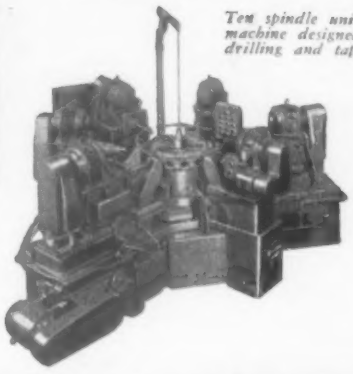


Close-up of tooling arrangement.



Crankcase blower section of airplane engine.



Ten spindle unit-type machine designed for drilling and tapping.

HOW COMBINING DRILLING AND TAPPING ON ONE MACHINE . . .

saved 13.58 minutes per piece . . . and replaced 3 machines

PART TOOLING AND OPERATIONS

Part — Crankcase Blower Section.

No. of Spindles — 10.

Unit No. 1—Combination drill for 1/4—20 tap and C' drill 17/16" dia.

Unit No. 2—1/4—20 tap.

Unit No. 3—Combination drill for 1/4—20 tap and C' drill 17/16" dia.

Unit No. 4—1/4—20 tap.

Unit No. 5—3 drills for 5/16—18 taps.

Unit No. 6—3 5/16—18 taps.

Prior to the installation of this 6-way unit-type drilling and tapping machine 3 machines were used to perform the same number of operations in 15.28 minutes. The present time with this equipment is 1.70 minutes or a saving of 13.58 minutes per part.

In addition to these savings, manpower was increased by replacing 3 machines and handling time was decreased considerably because 10 spindles work simultaneously instead of 3 at a time.

Perhaps an analysis of your present production methods will reveal an opportunity to effect similar savings with unit-type machines. Our engineers will be glad to work with you toward this end. Call on them without obligation.

HOW OTHERS HAVE INCREASED PRODUCTION WITH SPECIAL MACHINES is illustrated and described in this set of five bulletins which illustrate and describe an unusual variety of metal working production solutions. They may give you an idea for a more productive approach to your metal working problems. Write for them today. Ask for Bulletins 444.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

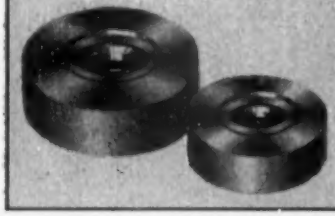
325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

TALIDE-TIPPED CENTERLESS BLADES

BLADES FOR CENTERLESS GRINDERS . . . TIPPED WITH **TUNGSTEN CARBIDE**

assure greater production and accuracy in the finish grinding of bullet cores, armor-piercing shot, shells, projectiles, tank parts, aircraft engine parts, rifle and machine gun parts; and a wide variety of screw machine products, shafts, spindles and special shape parts.

Talide-Tipped Tools for all types of turning, boring and facing operations on steels, cast iron and non-ferrous metals and non-metallic materials. Send for catalog No. 43-T.



Drawing Dies with Talide Nibs for deep drawing cartridge cases, bullet jackets, and other tubular products including cylinders, cans and containers. Send for catalog No. 43-WP.

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BUSHINGS · CENTERS · GAGES · BAR STOCK

METAL CARBIDES CORPORATION

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TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

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for Hydraulic Installations

If you need pump capacity between 5 and 37 G. P. M. or pressures up to 500 lbs. per sq. in. for hydraulic installations, Brown & Sharpe 500 Series Pumps are your answer. Herringbone gears, antifriction bearings, balanced operation, and other desirable features. Brown & Sharpe Mfg. Co., Providence, R. I.

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FOR CLOSER TOLERANCES IN *Precision* DRILLING

USE ACME DRILL JIG BUSHINGS

★ Close tolerances, precision drilling and other rigid specifications must be adhered to in the manufacture of critical war products. And Acme has been helping war industries to meet these requirements by supplying drill jig bushings that assure accurate location of drilled holes.

Wartime demands, however, required no change in manufacturing methods at Acme. The same standards of precision that existed prior to the war prevail today. And during peacetime, Acme bushings will continue to serve industry efficiently in the manufacture of post-war products.

In war or peace, make Acme your bushing headquarters.

ACME INDUSTRIAL CO.

Makers of Standardized Jig and Fixture Bushings

208 N. Laflin St. MONroe 4122 Chicago, Ill.

LIPPING FORM CUTTERS

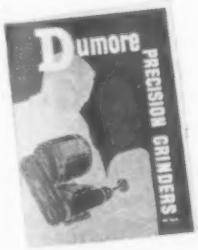
BOOSTS SCREW MACHINE OUTPUT

SINGLE DUMORE GRINDER AIDS LARGE BATTERY TO OPERATE AT CAPACITY

When long chips tangle with spindles, the operator wastes his time to pull them away and less than capacity production prevents efficient machine loading. One large screw machine shop solved this problem simply by lipping their form cutters, to curl and break chips properly.

A Dumore Precision Grinder (bench mounted) proved to be the best tool for this lipping operation . . . another example of the remarkable Dumore versatility and the strikingly large return which so often comes from a small investment—if the investment is in a Dumore.

Get the full story of tool room and production operations performed economically with Dumore Precision by sending for Catalog 42 today! The Dumore Company, Tool Division, Department TD43, Racine, Wisconsin.



Seven models and complete accessories described in this catalog. Send for your copy, Today!

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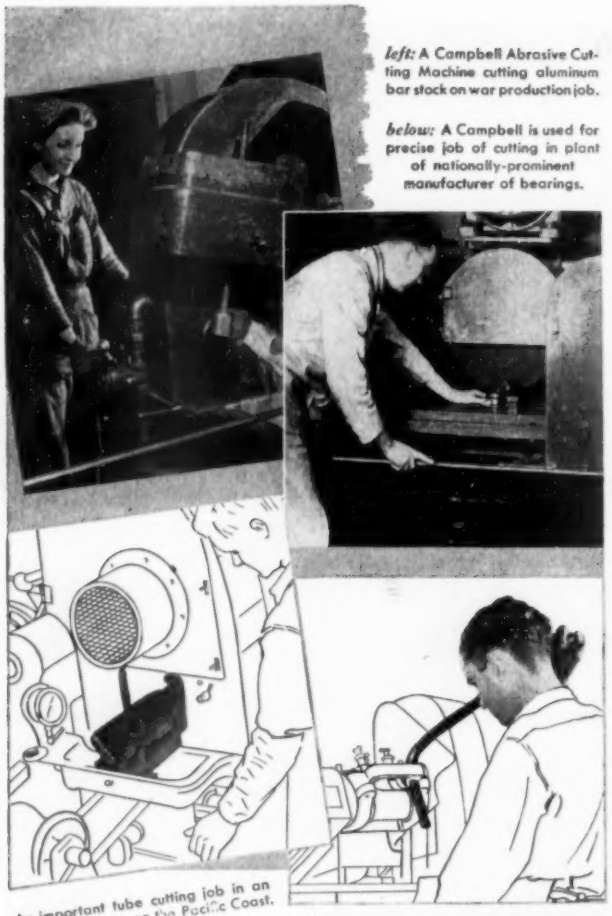
DUMORE GRINDERS ARE SOLD BY AUTHORIZED DISTRIBUTORS IN ALL PRINCIPAL CITIES



left: A Campbell Abrasive Cutting Machine cutting aluminum bar stock on war production job.

below: A Campbell is used for precise job of cutting in plant of nationally-prominent manufacturer of bearings.

An important tube cutting job in an aircraft factory on the Pacific Coast.

Precision set-up on a manually-operated Campbell in a war production plant.

WHAT IS *YOUR* CUTTING JOB?

These 4 **CAMPBELL ABRASIVE CUTTING MACHINES** are all different. Each is cutting different stock to different dimensions—none limited to the job it is doing.

CAMPBELL has the only complete range of Abrasive Cutting Machines—cutting annealed and unannealed steels, non-ferrous alloys, plastics, glass and ceramics —solid bar, tubular and flat stock.

What are you cutting? **CAMPBELL** can give you a procedure that will do the work better, make it easier to meet schedules and lower costs.

Get further information by writing the Andrew C. Campbell Division. State what material you are cuting, length of pieces before cutting, length of cut-off pieces and production required per hour.

Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

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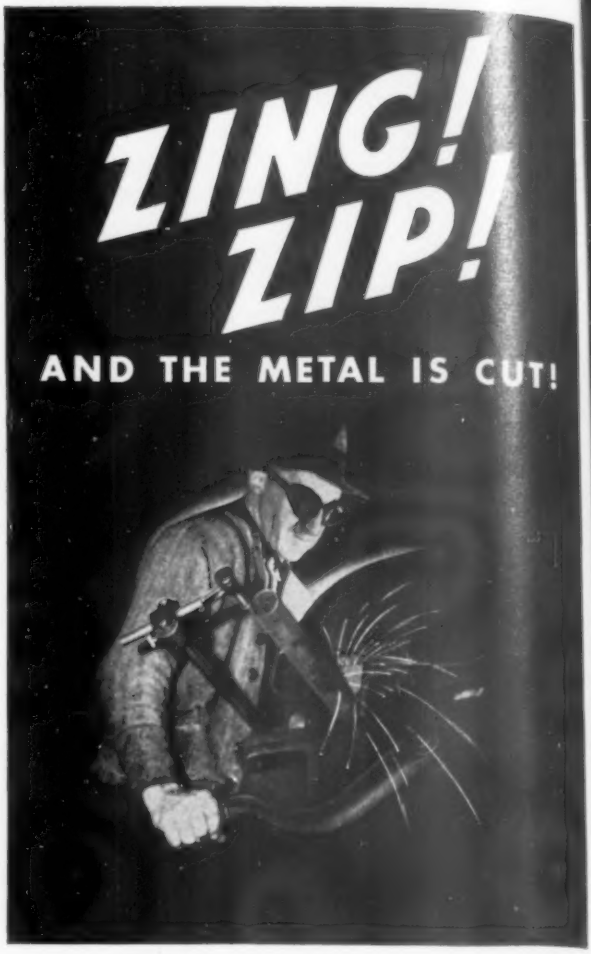

It's as easy as that when you cut with this new DeWalt High-Speed Metal Cutting Machine

This new, high-speed DeWalt will out-perform the ordinary types of "light metal" cutting machines you have heretofore been able to buy to do comparable work. It cuts metal fast, accurately, and with greater safety. *And it's built to last.*

One manufacturer, who has a battery of these high-speed DeWalts, is cutting S. A. E. 52100 solid bearing steel into $1\frac{5}{16}$" lengths—at the rate of 600 to 650 pieces per hour per machine, using women operators. The machines have already cut 4,500,000 pieces *and are still going strong.*

DeWalt engineering service helped this customer step up service. What is *your* metal cutting problem? We manufacture a complete line of metal cutting machines, and may be able to help you. Call in one of our engineers. Wire, write or phone DeWalt Products Corporation, 6100 Fountain Avenue, Lancaster, Pennsylvania.

DE WALT RADIAL POWER SAWS
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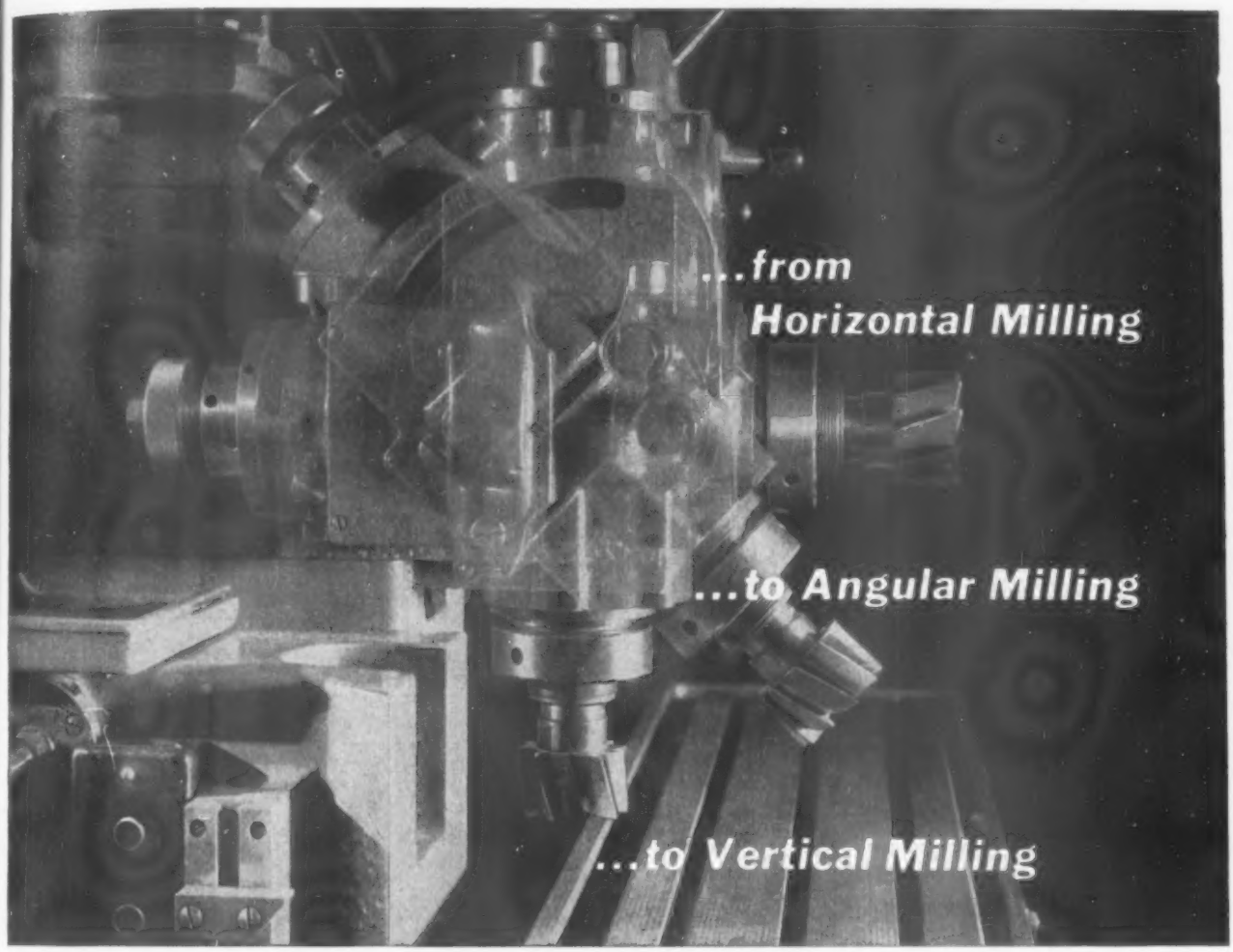
Quick Changes on Van Norman

RAM-TYPE MILLING MACHINES



When the operator has completed a horizontal cut on a Van Norman Ram-Type Miller, and wishes to proceed to an angular or vertical cut . . . *he does not need to touch the set-up on the table.* All he has to do is unclamp the swiveling cutterhead, swing it to the required position, reclamp . . . *and start the next cut.* Only a matter of moments, compared with the time needed to reset the work. And one of the greatest sources of errors is completely avoided. This exceptional ease and convenience of operation provide gains in time, accuracy and output. So today, throughout America's war industries, Van Norman Ram-Type Millers are delivering the goods in great plenty . . . and in plenty of time.

VAN NORMAN
Machine Tool Company
SPRINGFIELD, MASSACHUSETTS

In June, 1942, Van Norman was awarded the Army and Navy E in recognition of its war production record

SECOMET
DIAMOND WHEELS

When the war is won—Americans will enjoy higher standards of living than ever before. Motor cars, airplanes, trucks and tractors, home appliances, every machine and tool that's made of metal, will be better, safer and stronger. JKS Diamond Wheels will help to make this possible by processing tougher metals, with greater precision. Far-sighted companies are already designing new products, scanning new outlets and perfecting plans for cutting their costs with improved machine tools. To such executives this is an invitation to write today to—

J. K. SMIT & SONS
157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.

Ⓚ

GRAND Speed CLAMPS

The Most Complete and Up-to-the-Minute Line of Modern Time-Saving Clamps

Quickcet

Screws, Swivels and Handles
COPPER PLATED
against Welding Spatter

QUIKCET for fast (4-second) Clamping — Instant ratchet set and release, fulcrum screw tightening. 1-hand operation and a non-creeping grip even on irregular surfaces. Setting the pace in war production.

Dual Grip

DUAL GRIP — Double action malleable clamps. Side tightening for close working conditions. No twisting or creeping.

Ground Clamp

WELDERS' GROUND CLAMP. Completely copper plated, with connection for ground wire.

Alloy-Steel

ALLOY - STEEL Medium and heavy service "C" Clamps of **even greater than forged clamp capacity.** Also a complete line of Malleable "C" Clamps.

HEAVY DUTY SPEED CLAMPS. 2-handed, lever locking and instant release. Also Giant 10½" opening size.

Heavy Duty Speed

QUICK LOCKCET — For light fast work. Locking lever gib seat and instant trigger release.

Quick Lockcet

Our 32-page catalog illustrates and describes these production clamps in detail. A copy is yours for the asking. Write today.

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Accurate
√TURNING √THREADING √CUTTINGOFF
WITHOUT NEW TOOL SET-UP

With a Colwell turret you can get semi-automatic operation on your engine lathe. Production is increased as there is no time lost for new tool set-ups. The operator can change from one tool to another in just a few seconds, by simply indexing the turret to the next position. Method of indexing assures accuracy, thus allowing for high precision work. The turret carries four standard square tool bits or three tool bits and a standard cutting-off tool. Cutting-off tool mounts directly in the turret and is bevelled both sides for easy clearance. Save time with a Colwell turret. Good delivery. Send for new folder.

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25 Congress Ave., Prov., R. I.

Boyar-Schultz
SCREW MACHINE TOOLS
the Answer to the Demand for INCREASED SCREW MACHINE *Production*

It takes dependable Box Tools to bring out the great volume of which your screw machines are capable. But, many parts turned out does not mean FULL PRODUCTION unless there is a very high degree of accuracy in those parts made.

Boyar-Schultz Screw Machine Tools were designed to bring out the precision workmanship that means real PRODUCTION. They were designed after thorough study of the many tasks required of screw machines.

Boyar-Schultz
UNIVERSAL TOOL BIT GRINDING FIXTURE

With this Grinding Fixture you can grind both right and left hand tool bits from ¼" to ½" inclusive, to various chip clearance angles with precision exactness. This promotes increased production, longer tool bit life, closer tolerances and a better finish.

Less experienced operators can produce accurately ground tool bits singly or in quantity.

In Boyar-Schultz Screw Machine Tools you will find extra strength properly placed for extra sturdiness. This assures fine, accurate adjustments that hold for long runs of perfect parts.

IMMEDIATE DELIVERY FROM STOCK

Send For Literature Describing Boyar-Schultz Screw Machine Tools or for Complete Catalog.

BOYAR-SCHULTZ CORPORATION

2116 WALNUT STREET — CHICAGO 12, ILLINOIS

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"We use 'American Swiss' Swiss-Pattern Files on tool and die work because they hold their edges longer and outwear other files we have tried. They give us service at minimum cost, and our men are more satisfied when using them."

This user has concisely expressed three important reasons for his preference of "American Swiss" Files . . . long wear . . . lower filing expense . . . more satisfied machinists.

These reasons are of the greatest significance to every manufacturer whose work involves accurate or intricate filing, because they mean better filing at lower cost.

Thousands of plants all over the country have learned that "American Swiss" Swiss-Pattern Files are an investment that pays big dividends. It will pay you, too, to standardize on these precision tools . . . made in 3000 different shapes, cuts and sizes. Obtainable from our Distributor.

American Swiss File & Tool Co., Elizabeth, N. J.

ASK FOR THEM BY NAME

American Swiss

SWISS PATTERN FILES

Send me this

VALUABLE NEW SERVICE

—which I understand will help me to use Arc Welding to better advantage.

NAME

POSITION

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"PRACTICAL DESIGN FOR ARC WELDING"
—will put your imagination to work on the use of welding.
IDEAS GALORE LOOSE LEAF FORM
—clear and simple drawings easy to understand and apply.

Simplified

ARC WELDING

Now is the time to plan to use welding on your future production—to take advantage of experiences gained—to cut costs and yet build a better, stronger product. "Practical Design for Arc Welding" can help you plan. Ask for this service today.

HOBART Bros. Co.

Box TE-44 Troy, Ohio, U.S.A.

One of the World's Largest Builders of Arc Welders

SUPERPOWER *Rectangular Magnetic Chucks* are made in sizes from 4" x 8" to 24" x 86" work surface SUPERPOWER design represents the highest development of modern magnetic chucking. Rugged, rigid, durable, electrically correct.

To hold any size of work-piece... and for angular work, too... there are

SUPERPOWER

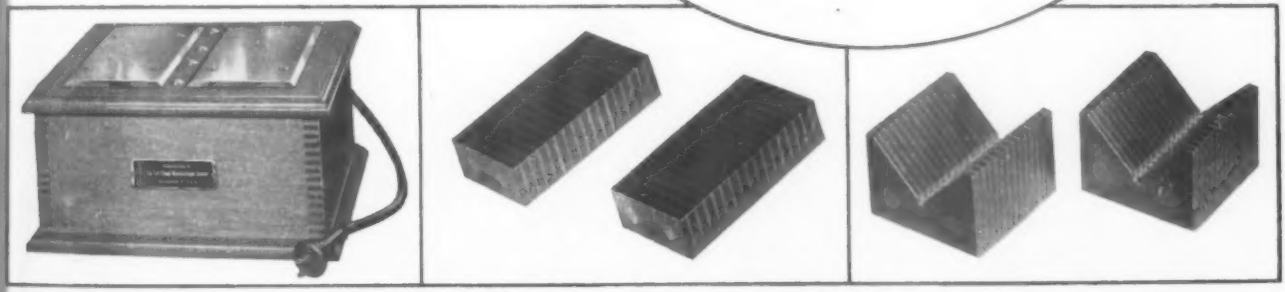
Magnetic Chucks

AND ACCESSORIES

TO DO YOUR JOB

AND SAVE YOUR TIME

SUPERPOWER *Precision Duplex Base Magnetic Chuck* is one of four styles of adjustable-base chucks for precision angular work. Swivels to 90° either side of horizontal, tilts to maximum angle of 14°. Sizes 4" x 8" to 6" x 18" work surface.



TAFT-PEIRCE *Double-Unit Demagnetizer* quickly removes residual magnetism from work.

SUPERPOWER *Universal Magnetic Parallels and V-Blocks* increase chuck utility — especially on parts of irregular shape.

To speed set-ups and widen machine work-range, there are types and sizes of Superpower Magnetic Chucks adaptable not only to grinders but also to millers, planers, shapers, lathes, and other machines. These all-steel, waterproof chucks have greater magnetic power, larger magnetic area, and a heavy concentration of flux at the face plate to increase versatility of set-up. Full details on the full line of rectangular, rotary, and special models, with control-switch and demagnetizing equipment, are given in the Superpower bulletin. Write on your letterhead for a copy *now*.

The TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

WILLEY'S

DEALERS
An attractive proposition open in certain territories.

DOUBLE END CARBIDE TOOL GRINDER Model 30

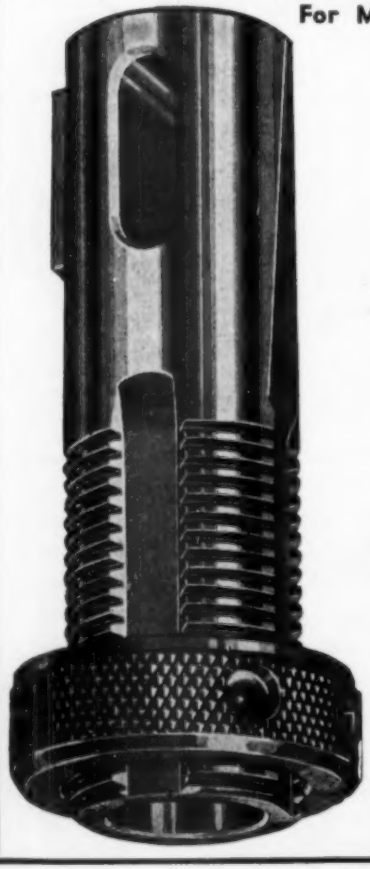
Assures highest accuracy for rough, semi-finish and finish grinding of Tungsten carbide tipped tools. Its sturdy construction insures a large volume of work on a production basis. Uses 8" vitrified wheel for rough and semi-finish, and 6" diameter wheel for finishing.
Cool Cutting is assured by a steady flow of coolant, force fed by an electrically driven pump.

WRITE FOR FOLDER

Contains complete specifications of Model 30 and other models. Also ask about Willey's Metal, 710, the new cutting grade of Carbide just announced for machining tough Alloy Steels.

WILLEY'S CARBIDE TOOL CO.
SOLE MAKERS OF WILLEY'S METAL
1342 W. Vernor Highway Detroit 1, Michigan

GLENZER ADJUSTABLE ADAPTERS
For Multiple Spindles



STANDARD EQUIPMENT FOR ALL DRILLING REAMING AND TAPPING MACHINES.

ADOPTED AS STANDARD BY LEADING AUTOMOTIVE AND MACHINE TOOL MANUFACTURERS

Utility Tools

THE J. C. GLENZER COMPANY
6463-6477 Epworth Blvd.
DETROIT MICHIGAN

Stuart's ThredKut SOLVOL SUPER KOOL CODOL

THE COST OF CUTTING FLUIDS IS MEASURED IN PENNIES...TOOLS AND PRODUCTION IN DOLLARS

IT pays to use the best. Stuart's ThredKut, Solvol, SuperKool and Codol are the best money can buy. A Stuart Oil Engineer will be glad to help you choose the best cutting fluid for the job.

Call him in.

For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865
Warehouses in All Principal Metal Working Centers

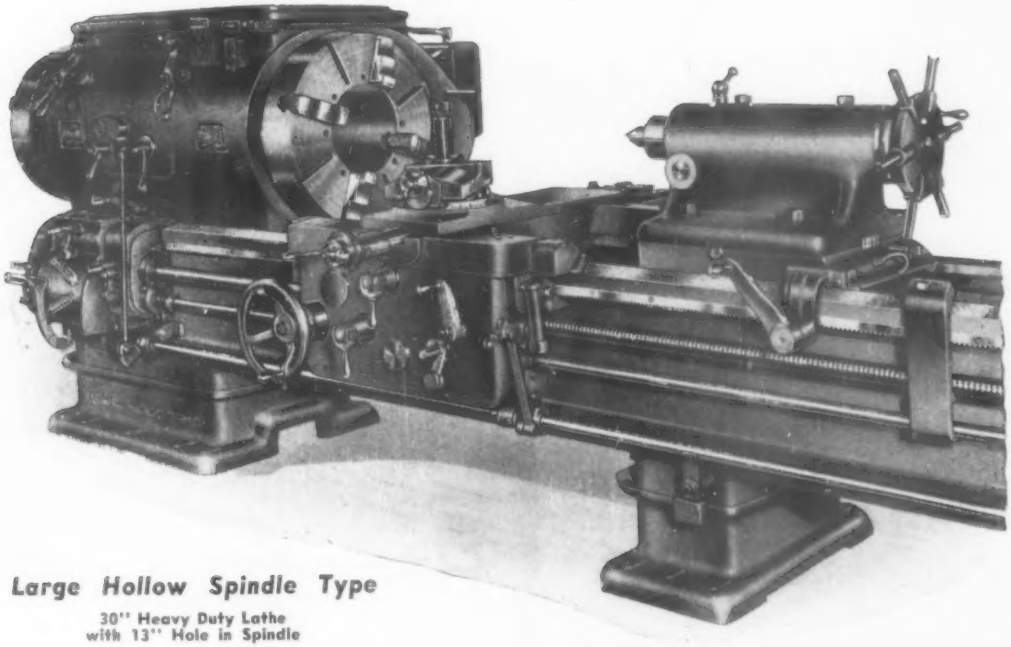
"A WORTH-WHILE CONTRIBUTION to the WAR EFFORT"
American Cutter & Engineering Corp.
31739 Mound Road,
Warren, Michigan.
Gentlemen:
The ---------- ---------- Division
of our ------- --------- Plant, reports that
your company, cooperating as a subcontractor
for cutting tools, is making a worth-while con-
tribution to the war production job we have to
do. We fully realize that no American firm
wants to be thanked for doing its job under
present-day conditions when each one of us
feels that it is both a patriotic obligation
and a privilege to do all within our capacity
to help win the war.
However, it is only just to tell you
that your help contributed to our output, and
to express our appreciation for your assistance.

APPRECIATION FOR SERVICES RENDERED

It is our constant aim to merit such appreciation for the accuracy and quality of our tools and the promptness of our deliveries.

A.C.E.
AMERICAN CUTTER & ENGINEERING CORP.
31741 MOUND ROAD • WARREN, MICHIGAN
SPECIAL CUTTING TOOLS

Streamline YOUR PRODUCTION WITH HYDRATROL LATHES

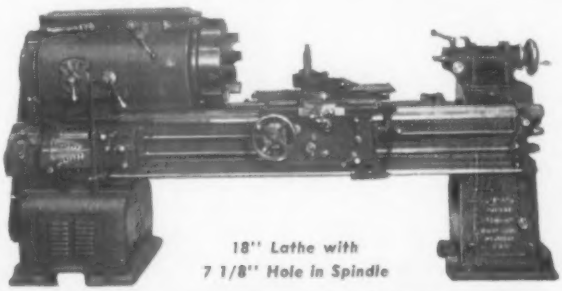


Large Hollow Spindle Type

30" Heavy Duty Lathe
with 13" Hole in Spindle

PLANTS EVERYWHERE REPORT...

- ✓ *Production Increased*
- ✓ *Product Improved*
- ✓ *Man-Power and Materials Saved!*



18" Lathe with
7 1/8" Hole in Spindle

FIVE SIZES PROVIDE WIDE RANGE OF USEFULLNESS AND EFFICIENCY!

Small, 18" up to 7 1/4" Hole Large, 27" up to 13" Hole
Medium, 24" up to 12" Hole Large, 30" up to 14" Hole
Large, 36" up to 16 1/2" Hole

(Standard type lathes, 16" to 36")

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND ★ SAINT LOUIS (3) MISSOURI

Rawhide PROTECTS

The tough, resilient, coiled rawhide faces of C/R Hammers and Mallets strike effective blows without battering or marring... protects finished surfaces, machines delicate insulation and parts. Speed die-setting, assembly, no fatiguing re-coil. Reduce breakage and spoilage. Sizes and weights for every need.

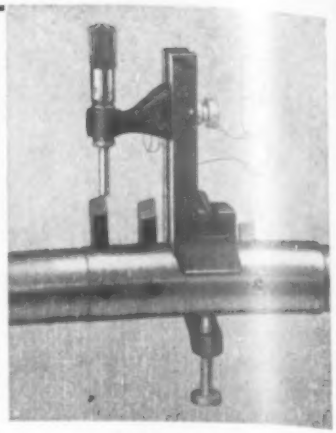
C/R Hammers have permanent malleable iron heads which take replaceable insert faces of coiled mechanical rawhide.

CHICAGO Rawhide MFG. CO.
1312 ELSTON AVE. ★ CHICAGO, ILLINOIS

SAVE TIME

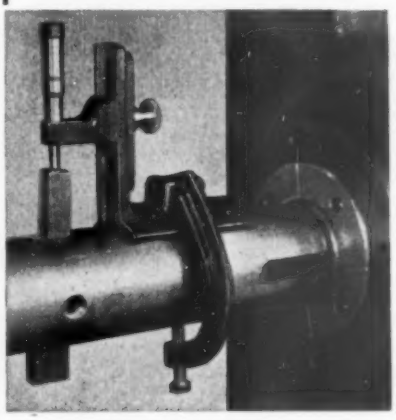
ON BORING-TOOL SETTING

Take ONE trial cut, mike it, then use the Bartelt Pedestal Micrometer as shown here to move the tool the exact amount required to bring the next and final cut exactly to size. Or, set the tool from the O.D. of the bar, and make only one cut.



MODEL "B"

MODEL "A"



BARTELT PEDESTAL MICROMETERS

Made in two models as illustrated. Dial indicators can be furnished in place of micrometer heads. Useful for many other gaging, set-up, and inspection jobs. Write for circular.

BARTELT ENGINEERING COMPANY
1220 D Partridge Ave.
Beloit, Wisconsin

"LOGAN"

SURE FLOW Centrifugal COOLANT PUMPS For MACHINE TOOL APPLICATIONS

Write For Catalog 61

LOGANSPORT MACHINE, INCORPORATED
902 PAYSON ROAD LOGANSPORT, INDIANA
Manufacturers of Air & Hydraulic Devices, Chucks, Cylinders, Valves, Presses, Accessories

PRECISION

is the basic weapon behind the firing line

MANY SIZES IN STOCK

SMITH TOOL & ENGINEERING CO.
862 N. Sandusky Ave., Bucyrus, Ohio

For *Precision Accuracy* you need
SMITH MASTER SURFACE PLATES

PLAINER FINISH & LAPPING PLATES ALSO AVAILABLE

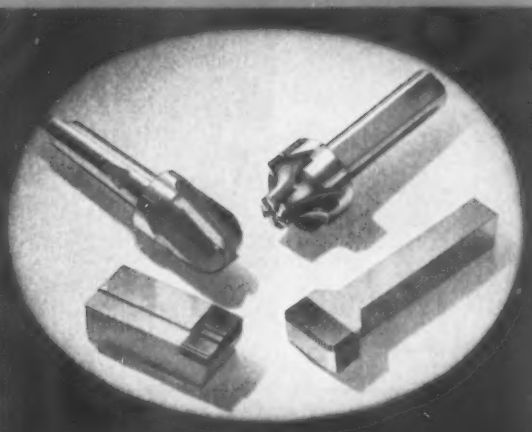
GEAR CUTTERS • UNGROUND GEAR AND SPLINE HOBS • GROUND AND UNGROUND MULTIPLE THREAD MILLING CUTTERS

MILLING CUTTERS • BROACHES • FORM TOOLS • END MILLS • HOBS

COUNTER BORES • REAMERS • STANDARD END MILLS AND MILLING CUTTERS FROM STOCK • SPECIAL CARBIDE TIPPED TOOLS

GEAR CUTTERS • UNGROUND GEAR AND SPLINE HOBS • GROUND AND UNGROUND MULTIPLE THREAD MILLING CUTTERS

HUDSON
Douglas Aircraft
CROSLEY
CURTISS-WRIGHT
AMERICAN CAN CO
CRUCIBLE STEEL
RCA
CATERPILLAR TRACTOR
AERONCA
MINNEAPOLIS-MOLINE POWER IMPLEMENT
INTERNATIONAL HARVESTER
PRATT & WHITNEY AIRCRAFT
WARNER & SWASEY
ALLIS-CHALMERS
TIMKEN
CHEVROLET
CHRYSLER
MUNCIE GEAR
STUDEBAKER
Bendix
OTIS ELEVATOR
REMINGTON RAND
McQuay-Norris
REPUBLIC Aviation
Massey-Harris
BUICK
OHIO SEAMLESS TUBE
GLOBE TUBES
Allison
Ford
AIR ASSOCIATES
TELETYPE
OLDSMOBILE
SAVAGE ARMS
JACK & HEINTZ
UNDERWOOD ELLIOTT FISHER
NASH MOTORS
CRANE
KEARNEY & TRECKER
BRIDGEPORT BRASS
DEERE & COMPANY
A. O. SMITH
WILLYS-OVERLAND MOTORS
BORG-WARNER
Thor



LAKE SHORE CARBIDE TIPPED TOOLS GET FIRST CALL IN MANY FAMOUS PLANTS FOR ACCURACY, HIGH SPEED PRODUCTION AND LOW COST.

MILLING CUTTERS • BROACHES • FORM TOOLS • END MILLS • HOBS

Back of every Lake Shore Tool are the facilities and skilled personnel of one of America's most completely equipped plants.

LAKE SHORE TOOL WORKS INC.

Send us your blue prints for quotations on your high speed tool, special tool, and carbide production tool requirements.

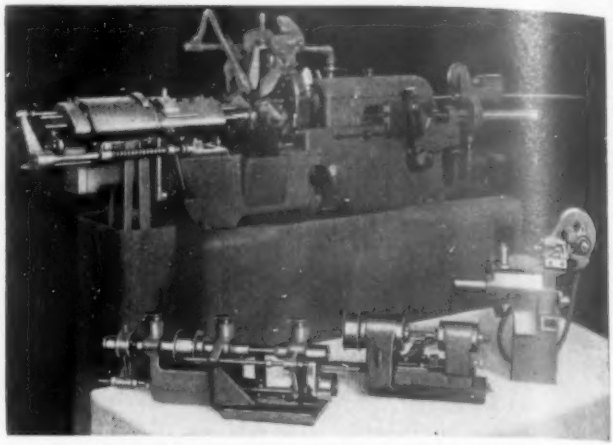
816 NORTH KOSTNER AVENUE • CHICAGO 51, ILLINOIS

NEW EQUIPMENT

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

• Materials + Processing •

Heavy Duty 40 HP Grinder with 30-Inch Wheels



Machine Attachments for Wickman Automatic

NEW GRINDER FEATURES SPINDLE SPEED CONTROL (N33)

Featuring automatic regulation of variable speed control, a new 40 horsepower grinder, using 30″ wheels has been introduced by Vonnegut Moulder Corp.

Designated as the Marschke Vari-Speed Grinder, the machine has a speed control which assures the right spindle speed to maintain constant rim speed for worn wheels, with protection against over-speeded full size replacements, according to the company. Heavy construction and adequate safety features also are important advantages cited by the manufacturer. The heavy duty motors have overload capacity of 50 to 80 horsepower to get the most out of 24″ or 30″ wheels.

STRETCH HEAD DESIGNED FOR UNIFORM HOLDING (N34)

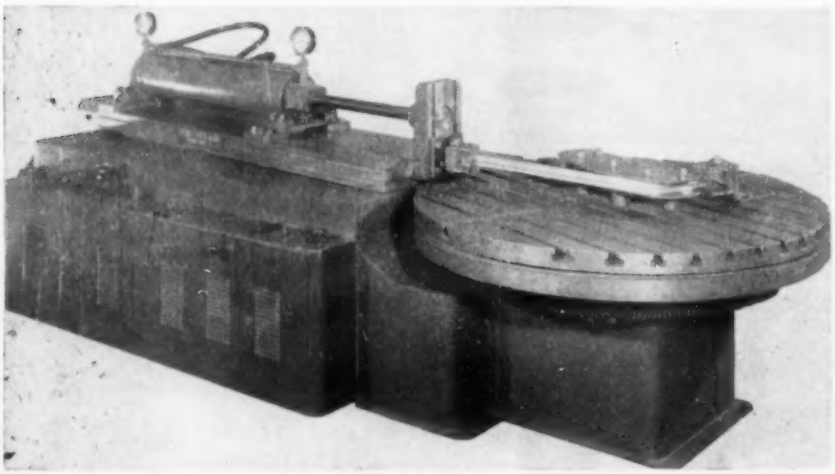
Developed for use with stretch forming presses, a semi-standard stretch head is announced by Cyril Bath Co.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

The casing of the head is made in various sizes and may be fitted with jaws giving two, three, or four angular or sliding movements so arranged as to grip almost any shape evenly and over the maximum amount of surface. The heads, which have been used successfully on all grades of aluminum alloys and stainless steel, can be adopted to pulling extruded shapes, brake or rolled sections, or flat sheet work.

In the large sizes, either air or hydraulic cylinders perform initial clamping and release work, and in the smaller sizes the jaws may be hand released. The jaws are so constructed that different inserts can be readily adapted to accommodate different shapes.



Semi-Standard Stretch Head For Use on Stretch Forming Presses

ATTACHMENTS WIDEN RANGE OF WICKMAN AUTOMATIC (N35)

Five new attachments which increase the work that can be handled on the Wickman No. 2 Swiss Type Automatic have been announced by The Wickman Corporation.

The set of attachments includes a three spindle attachment for multiple operations, and separate attachments for high-speed drilling, threading, slotting, and taper pin turning.

Centering, drilling, reaming, threading or tapping, may be performed with the three-spindle attachment. Indexing is controlled by two plate type cams, and feeds are governed by a sleeve type cam.

The No. 1 spindle is non-rotating and is used for centering and drilling. For drilling and reaming operations, the No. 2 spindle may either rotate in the opposite direction from the machine spindle or remain stationary. No. 3 overruns the machine spindle for precision threading, but can be held stationary for drilling and reaming.

Consisting of a sliding head rotating in the opposite direction from the machine spindle, the high-speed drilling attachment may be used for drilling and centering operations. The threading attachment overruns the machine head and performs precision threading with self-opening die heads.

The slotting attachment is used to slot or mill the end of any part produced on a Wickman No. 2 Automatic. The taper attachment augments the regular tapering equipment of the machine and provides for making long, extremely accurate tapers.

NEW THREAD GRINDER HAS SPEED CONTROL (N36)

Said by the manufacturer, Dalzen Tool & Mfg. Co., to provide highest possible production and quality of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters, a new type of thread grind-

(Continued on page 166)

FREE INFORMATION and SERVICE

Request the information and service you desire and keep your library up-to-date . . .

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THREE FREE SERVICES without obligation

For your convenience these three business reply cards enable you to request quickly

1:
New catalogs — bulletins listed in this issue.

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Additional information or bulletins relative to new equipment — new materials or new processes.

3:
When answering advertisements, specific information on problems or company representative's call.

HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail.

Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described.

In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

USE THIS CARD

for requesting new catalogs and bulletins listed in this issue.

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for requesting additional information or bulletins about new equipment, materials, processes, etc.

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when answering advertisements, to obtain specific information on problems, or when you desire a company representative to call.

Write in square, number of item describing one catalog wanted ➔ ☐

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THE TOOL ENGINEER, APRIL, 1944

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USE THESE FREE REPLY CARDS

They are provided for your convenience in requesting information and service . . . . .

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ANSWERING ADVERTISEMENTS
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LITERATURE
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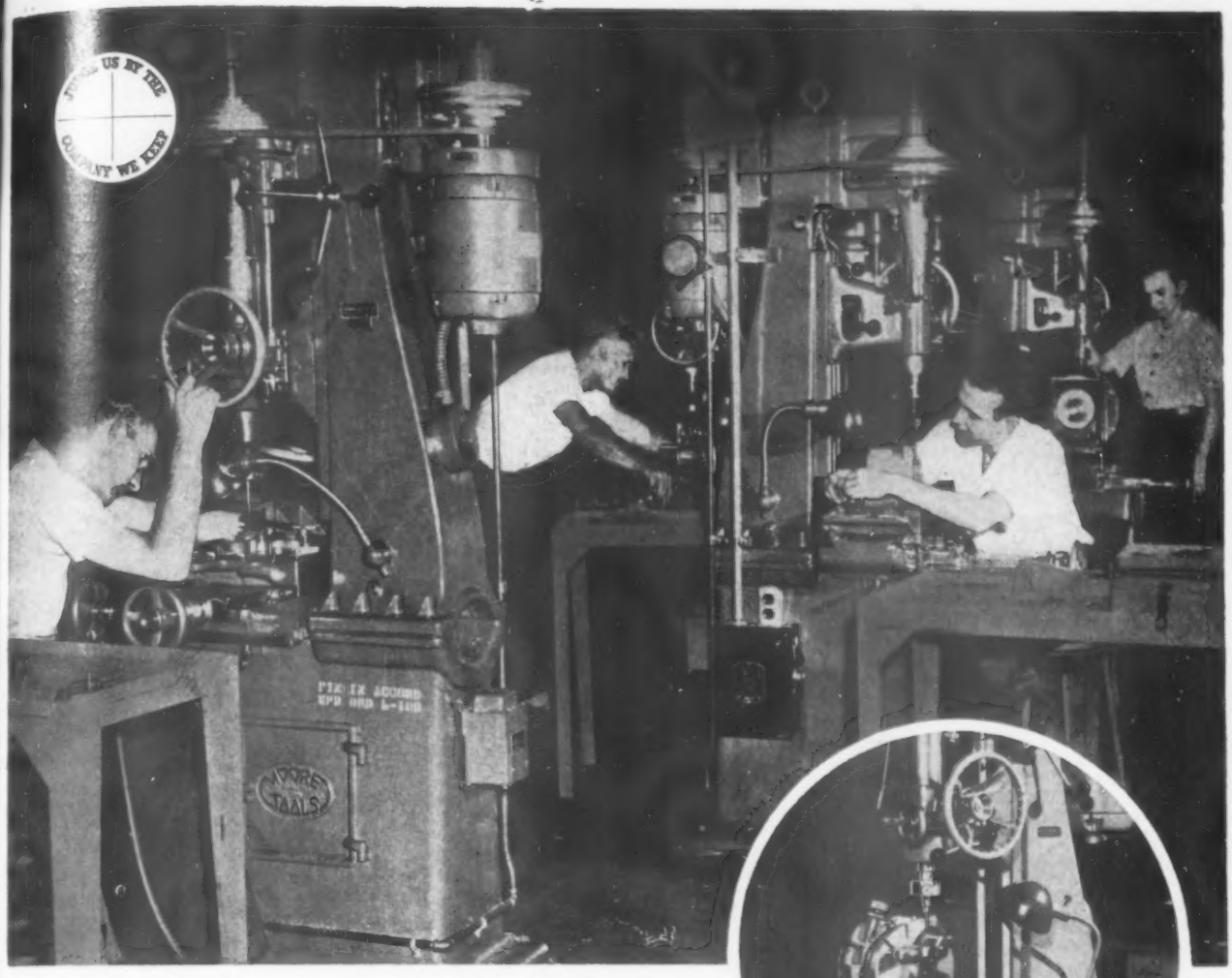


Photos Courtesy of Sperry Gyroscope Co., Inc.

SPERRY . . .

DEMANDS 'MICRO-ACCURACY'

Moore Jig Borers Reply With .0002" Tolerances

❍ ❍ ❍ High on the list of war devices upon which Uncle Sam's armed services depend for their striking power are those that bear the name of SPERRY. Tolerances in tenths are the rule rather than the exception at the Sperry Gyroscope Company, Inc.

The Moore Jig Borer meets all requirements of accuracy, efficiency and ease of operation for the boring of holes in jigs, fixtures, dies, gauges and special, accurate machine parts. It is highly sensitive for holes of 1/32" diameter and yet rugged for heavy cuts up to 4½". Operators can spot, drill, ream and bore in one uninterrupted sequence.

PARTNER in Production ❍ This companion machine, the Moore Jig Grinder, corrects and finishes jig-bored holes on both hard and soft work within .0001". We will be glad to show you how the "Partners in Production" can modernize your toolroom operations.

MOORE SPECIAL TOOL COMPANY INC.

740 UNION AVENUE, BRIDGEPORT 7, CONN.

Dalzen Thread Grinder

er has been placed upon the market.

The machine is electronically controlled, and speeds of the work and grinding wheel are individually controlled by dial settings. The variation is stepless, the ratio of speeds both forward and reverse is infinite, and gear change is reduced to a minimum.

The grinder is available in two models. The No. 5 Universal machine handles a wide variety of work up to 9¼" length of thread any place on a 20" shaft. The No. 6 model without back-off feature handles work up to a full 20" length of thread on a 20" shaft.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

NEW GRINDERS INCREASE SMALL PARTS OUTPUT (N371)

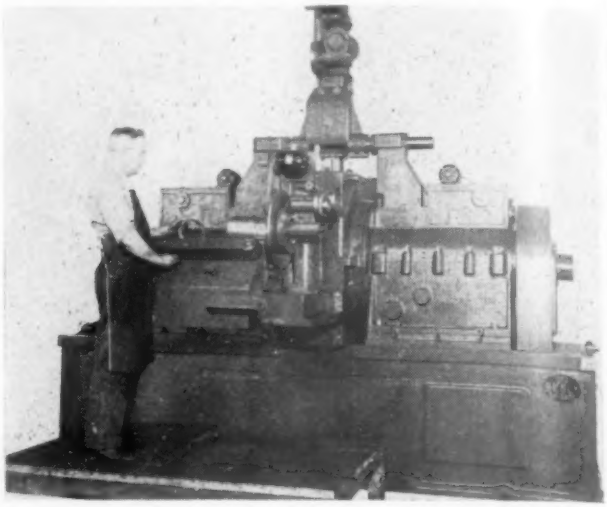
Accurate grinding of small parts with parallel surfaces, such as washers, oil seals, and sides of bearing races, is possible at new high speeds with Besly grinders No. 253 and 926, a[c]ording to the manufacturer, Charles H. Besly & Co.

Production at the rate of 12,000 pieces per hour on rough and semi-finished grinding is possible with No. 253, a double horizontal spindle grinder, with an improved automatic feed. Machine No. 926, a double vertical spindle grinder will turn out finished rings to .0002" tolerance at the rate of 8500 per hour.

Since both machines are wet grinders, warpage as a result of grinding

(Continued on page 168)

Besly No. 253 Grinder For High Speed Production On Small Parts



HOW AMERICAN INDUSTRY PRODUCES MORE, FASTER, BETTER WITH BOWSER EXACT LIQUID CONTROL

SAVED—A FLOOD OF PRECIOUS SOLVENT... *and costs cut to one-tenth*

A small ocean of paint is needed to protect planes and other war goods against rust and corrosion.

A Cleveland paint maker, irked at seeing much precious solvent wasted with dirty paint and residue (reclamation processes then used were prohibitively costly), looked for a practical solution . . . and called a Bowser Liquid Control Engineer.

A Bowser Still, basically similar to those which Bowser makes for the dry-cleaning industry, was recommended . . . and installed. With it, thousands of gallons of solvents were reclaimed at a cost of only a few cents per gallon, about one-tenth of the old cost. At that rate of saving, the Still paid for itself in its first 150 hours of operation.

Maybe your plant operation doesn't require Stills.

But you do need filters, or lubrication units, or meters . . . likely several of the many exact liquid control devices made by Bowser. Here's a quick case history of a Bowser Filter operation:

A manufacturer had grinding wheel trouble . . . too much glazing from wheel and metal dust; too much expense for dressing, which required too many diamonds. Four remedies were tried. All failed. Then a Bowser Pressure Filter was installed. **Results: 1—27% increase in production. 2—80% reduction in wheel dressing; comparable saving in diamond cost. 3—42% reduction in scrap. 4—Greatly improved quality of work.**

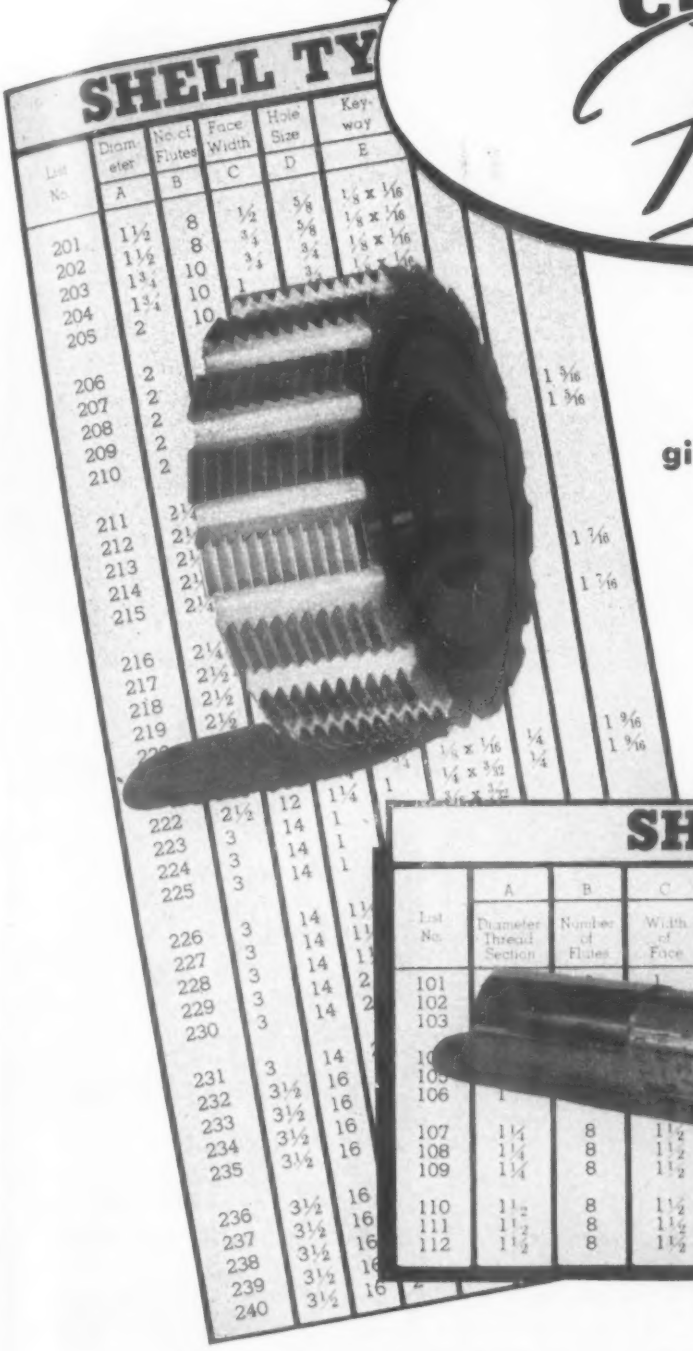
And here's an important point to remember—wherever your plant is located, you're close to a complete Bowser service organization. BOWSER, INC., Fort Wayne 5, Indiana.

BUY WAR BONDS

BOWSER ESTABLISHED 1885

THE NAME THAT MEANS **EXACT CONTROL** *OF LIQUIDS*

HOW TO GET THREAD MILLING CUTTERS *Faster*



SHELL TY

List No.	Diameter A	No. of Flutes B	Face Width C	Hole Size D	Keyway E
201	1½	8	½	⅝	⅛ x 1/16
202	1½	8	¾	⅝	⅛ x 1/16
203	1¾	10	¾	¾	⅛ x 1/16
204	1¾	10	1	¾	⅛ x 1/16
205	2	10			
206	2				
207	2				
208	2				
209	2				
210	2				
211	2¼				
212	2¼				
213	2¼				
214	2¼				
215	2¼				
216	2¼				
217	2½				
218	2½				
219	2½				
222	2½	12	1¼	1	¼ x 1/16
223	3	14	1	1	¼ x 3/32
224	3	14	1	1	
225	3	14	1	1	
226	3	14	1	1	
227	3	14	1	1	
228	3	14	1	2	
229	3	14	1	2	
230	3	14	1	2	
231	3	14	1	2	
232	3½	16	1	2	
233	3½	16	1	2	
234	3½	16	1	2	
235	3½	16	1	2	
236	3½	16	1	2	
237	3½	16	1	2	
238	3½	16	1	2	
239	3½	16	1	2	
240	3½	16	1	2	

Order by

STOCK BLANK NUMBER

giving Pitch and Thread Form desired

•

DETROIT

STANDARD STOCK BLANKS MEET 90% OF ALL THREAD MILLING CUTTER REQUIREMENTS

SHANK TYPE

List No.	A Diameter Thread Section	B Number of Flutes	C Width of Face	D Length of Shank	E Length Overall	F Shank Diameter Large End	G Shank Taper: Jarno	G Shank Taper: Brown & Sharpe	G Shank Taper: Morse	H Drawbar Threads
101				3 11/16	5¼	.884	7			½-13NC
102					5½	.922		8		½-24NF
103									3	½-13NC
104										½-13NC
105										½-24NF
106	1									½-13NC
107	1¼	8	1½	4¼	6¼					½-13NC
108	1¼	8	1½	4¼	6¼					½-24NF
109	1¼	8	1½	3⅛	5½	.948				½-13NC
110	1½	8	1½	4 11/16	6¼	1.134	9			½-13NC
111	1½	8	1½	4¼	6¼	1.271		10		½-24NF
112	1½	8	1½	3⅛	5½	.948			3	½-13NC

FOR STANDARD STOCK SIZES, ASK FOR BULLETIN No. CB-43

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

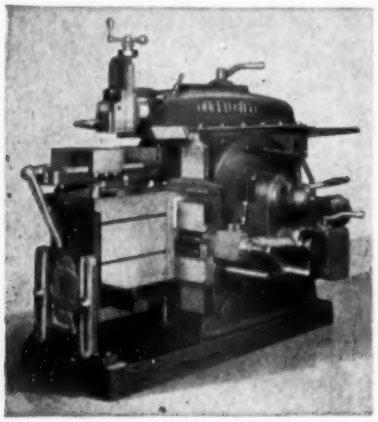
8432 BUTLER
DETROIT 11
MICH. U.S.A.

has been practically eliminated and rejects are substantially reduced, the company states.

SHAPER ADAPTED TO SHOP OR TOOL ROOM WORK (N38)

Said to be readily adaptable for machine shop and heavy or general tool room work, a new 20" shaper, designated as the Super Twenty, has been announced by the Queen City Machine Tool Co.

Features of the machine include a feed range of .008" for finishing, to a hogging feed of .191" for heaviest roughing; a dry multiple disc clutch, requiring a minimum of attention and adjustment; push button control; high torque motor; an electrical limit switch that stops the machine if either the power rapid traverse control or the feed is overrun, and a rugged heavy-duty vise with hard steel jaw inserts.



Queen City Shaper

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

PICK-UP PROJECTOR IMPROVES THREADING (N39)

Greatly increased productivity of thread grinders, important economies in time, material, and manpower, and improved quality of threaded parts are features cited by Acme Industrial Co. for its new thread pick-up projector.

The unit is an optical device for presetting the driving dog on pre-threaded work. When work is placed in the grinder, the grinding wheel enters the trough of the oversize thread to remove finishing stock from both flanks without further adjustment. The operation is performed on each piece while the preceding piece is being ground, eliminating lost time. Only one pass of the grinder is required to meet most production requirements.

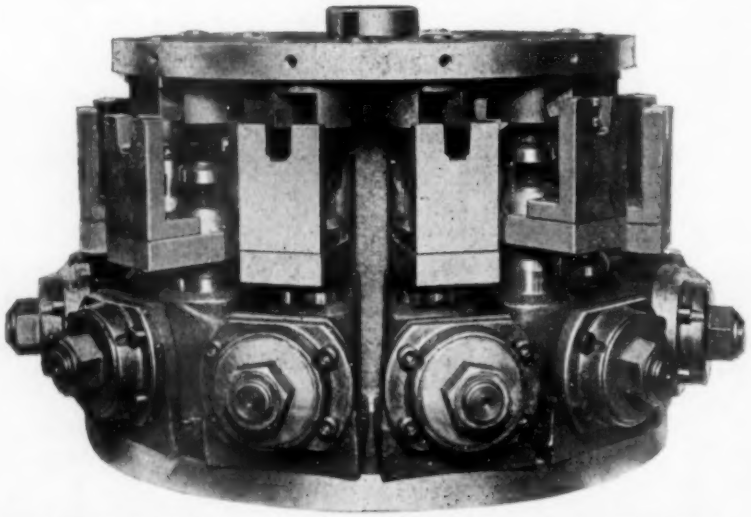
Because the unit simplifies the operation of picking up the thread, it can be used to follow a schedule of precutting, hardening, and finish grinding. This reduces grinding time because much stock has been removed in the screw machine or other high production tools. The company also states that wheel and diamond life are prolonged because the little stock removed does not require frequent dressing as in full depth grinding. Inspection of thread angle and root depth is made in the same setting by means of graduations incorporated in the viewing screen at the top of the projector.

Thread Pick-up Projector

NEW CENTERLESS GRINDER HAS IMPROVED DESIGN (N40)

Provided with numerous features of design previously not used on grinders of its type, a new centerless grind-

(Continued on page 170)



Multiple index fixture to locate and drill hole in boss of brake lever.

REDUCE LOADING TIME WITH SWARTZ LOCKS

COMPACT, POSITIVE CLAMPING

MORE PIECES PER HOUR

ALL LOCK PARTS ARE HARDENED AND GROUND

SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley **Detroit, Michigan**

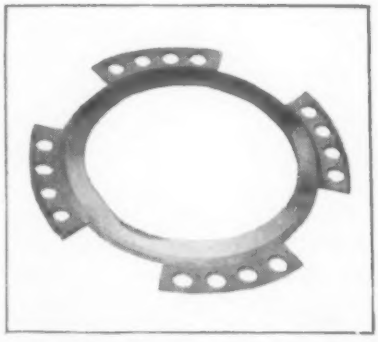
Represented by

Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Chicago—Ernie Johnson

Canada—Hi-Speed Tools, Ltd., Galt, Ont.
St. Louis—Mill Supply & Mach. Co.
Beverly Hills, Cal.—Production Tool Engineering
Houston—Engineering Sales Co.

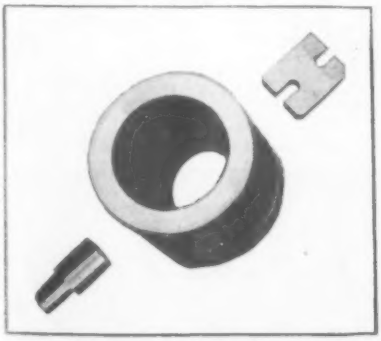
Oneida, N. Y.—W. F. Himmelsbach
Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool & Equipment Co.

Chrome Plating *used to be* Decorative too!



Unusual aircraft machine part salvaged by Hartford Chrome.

Like the bathing beauty who is now welding on the Swing Shift, chrome plating has gone in for sturdier pursuits. Matter of fact, its wartime improvements have come so fast, the question is, *"Have YOU kept up?"* Salvage by plating is one-half the story. The other half is the brilliant record of hard chrome plate on the production line, prolonging the life and increasing the efficiency of tools, dies and molds. If you're responsible for production or maintenance, you want the up-to-date facts on hard chrome plate. Write for them today.



Typical gage jobs being plated every day by Hartford Chrome.

Valuable "Show-How" Literature

Concise, important information for Tool Engineers, Plant Managers, Foremen, Purchasing Agents, etc. A request on your letterhead, and it's yours, with our compliments.

AREA WE SERVE

HARTFORD CHROME CORP.

525 PARK STREET • HARTFORD 6, CONNECTICUT • TEL. 2-6868

Licensed by United Chromium Inc.

Landis Tool Grinder

ing machine has been introduced by Landis Tool Co. A principal feature of the machine, designated as Landis Tool No. 12, is a hydraulically operated regulating cross slide, which permits dressing the regulating wheel by traversing the wheel base across the point of a positively held diamond. The path of contact between the regulating wheel and the diamond is the same as that between the regulating wheel and the work. The cross slide further provides a means for accurately aligning the work rest blades.

The regulating wheel may be swiveled for the grinding of tapers, eliminating wheel loss due to unnecessary trueing of the regulating wheel when changing over from one taper to another, from a straight surface to a taper surface, or vice versa. The machine is adapted for thrufeed, infeed, or endfeed operations.

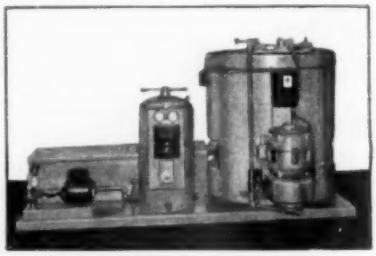
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

OIL RECOVERY UNIT SALVAGES LUBRICANT (N41)

Savings of as much as 85 per cent of cutting oils previously discarded are claimed by the Hilliard Corporation for its small oil recovery plants.

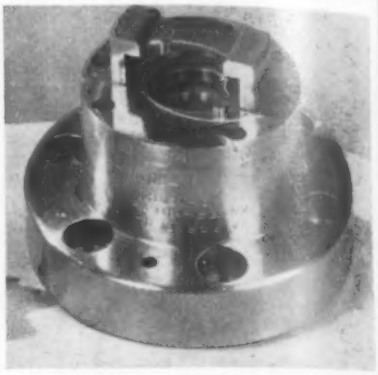
The unit is used for extraction of oil from metal chips and for filtering and sterilizing the recovered oil. It also is used for purification of cutting oils used in various machine tools, resulting in further tool and oil saving and better and increased production of finished material. The unit is especially well suited to smaller shops.



Small Oil Salvage Unit

TWO-JAW FINGER CHUCK HANDLES ROUGH SHAPES (N42)

A new two-jaw compensating finger chuck designed so that either jaw may pull in farther than the other to compensate for varying thickness of rough-



Compensating Finger Chuck

surface work pieces, has been introduced by Anker-Holth Mfg. Co.

The design is arranged so that the work is located from a finished round shoulder on the bottom of the casting by two hardened and ground pins, which also serve as drivers. The chuck body is made for direct mounting on any American Standard spindle nose, but it also can be mounted on any spindle by using an adapter. The chuck is particularly useful for second operation work which must be concentric

(Continued on page 172)

★ ★ ★ ★ ★ ★ ★ ★

Circular and Flat Form Tools, Gear Cutters, Counterbores, Gear Shaper Cutters, Reamers

NATIONAL Tools CLEVELAND

★ ★ ★ ★ ★ ★ ★ ★

Special Tools, Hobs, Ground and Unground, Slitting Saws, Broaches, Milling Cutters, Herringbone Cutters

When it's all over—

Users of cutting tools
can depend upon having
National Cleveland Tools—
accurate and durable—
for peacetime production.

National Tool Company will
have no conversion problems.
Its 38 years of experience
are at your service today,
tomorrow and always.

Onward, America!

NATIONAL TOOLS ARE THE SHAPERS OF PROGRESS

ARMY NAVY

NATIONAL TOOL Co.

11200 MADISON AVENUE CLEVELAND, OHIO

BARNES

where Quality Counts

From selection of steel to the final rigid inspection every step in the Barnes production process has quality as its aim. This is the reason discriminating buyers make a point of specifying Barnes band saws and hack saw blades — made by blade specialists, for metal cutting exclusively. Order from your Mill Supply Distributor.

The W. O. Barnes Company is glad to co-operate with the War Production Board in promoting tool conservation. Barnes factory trained service men are available in helping to solve blade problems

W. O. BARNES CO. INC.

DETROIT MICHIGAN

with the locating surface within extremely close limits.

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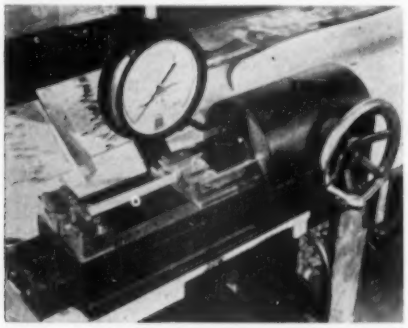
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

NEW TESTER CHECKS SHEET METAL WELDS (N43)

A complete and accurate check of the tensile strength of spot welds on thin sheet metal is possible in a one-minute operation with the S-A Tensile Tester, according to the manufacturer, Streeter-Amet Co.

The sheet metal is dropped into the tester and held by positive clamping action. Hydraulic pressure is applied and the breaking load in pounds pull is read directly from a dial, without computation. The operator does not need special training to perform the test.



Spot Weld Tester

TORQUE WRENCH DESIGNED FOR SOFT PARTS (N44)

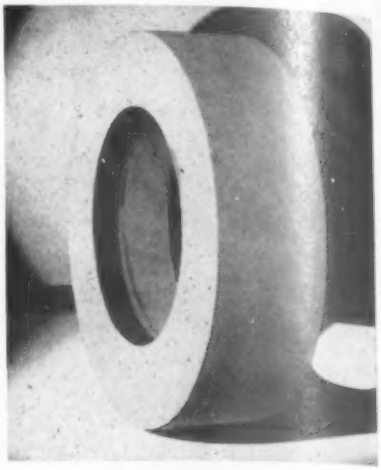
A new lightweight torque wrench, designed to give accurate inch ounce and pound torque readings, has been introduced by Apco Mossberg Co. According to the company, the proper degree of tightening can be obtained in work with soft, light metals or plastics liable to damage from too much tension. The wrench measures torque by the spread between two of several bars in the shank giving a direct reading on a sturdy brass scale near the handle. Weighing as little as six ounces, it is available in four sizes to measure tension in ranges of 0 to 100 inch ounces, 0-30, 0-50, or 0-100 inch pounds. It fits standard socket and can be furnished in any square drive required.

Lightweight Torque Wrench

NORTON 57 ALUNDUM ABRASIVE AVAILABLE (N45)

Norton Co. has announced that grinding wheels made of its 57 Alundum abrasive now are available for general use.

This abrasive, an improved aluminum oxide product, was developed by the company several years ago but has been used only on critical [illegible] jobs. It is said to be superior for [illegible]ndrical grinding, centerless grindi[illegible]nternal grinding, and snagging (slow speed). The company states the 57 Alundum abrasive is more friable than regular Alundum abrasive, assuring a fast, cool cutting action.



Norton Abrasive Wheel

MULTIPLE CHUCK SPEEDS MILLING OPERATIONS (N46)

Increases up to 500 per cent in milling operations without the addition of men or equipment is possible with a new hydraulic multi-grip milling chuck,

(Continued on page 174)

Cut Rejects IN TAPPING AND REAMING!

Spoilage losses due to oversize or bell-mouthed holes in tapping and reaming can often be elimnated entirely by using a Ziegler Floating Tool Holder—because such losses are most commonly caused by the spindle being out of alignment with the work.

The Ziegler Holder, because of its floating action, automatically compensates for inaccuracies in set-up, enabling the tool to do a perfect job despite the fact that it may be out of alignment as much as 1/32".

Try it in comparison with any other tool holder on the market and see for yourself how much better work it does.

It Always Floats

Made To Fit Any Machine

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

W. M. Ziegler Tool Co.
1920 Twelfth St.
Detroit 16, Mich.

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

WRITE FOR CATALOG

Let Today's Higher Production Pave The Way to Tomorrow's Lower Costs...

LIPE

PNEUMATIC BAR FEED

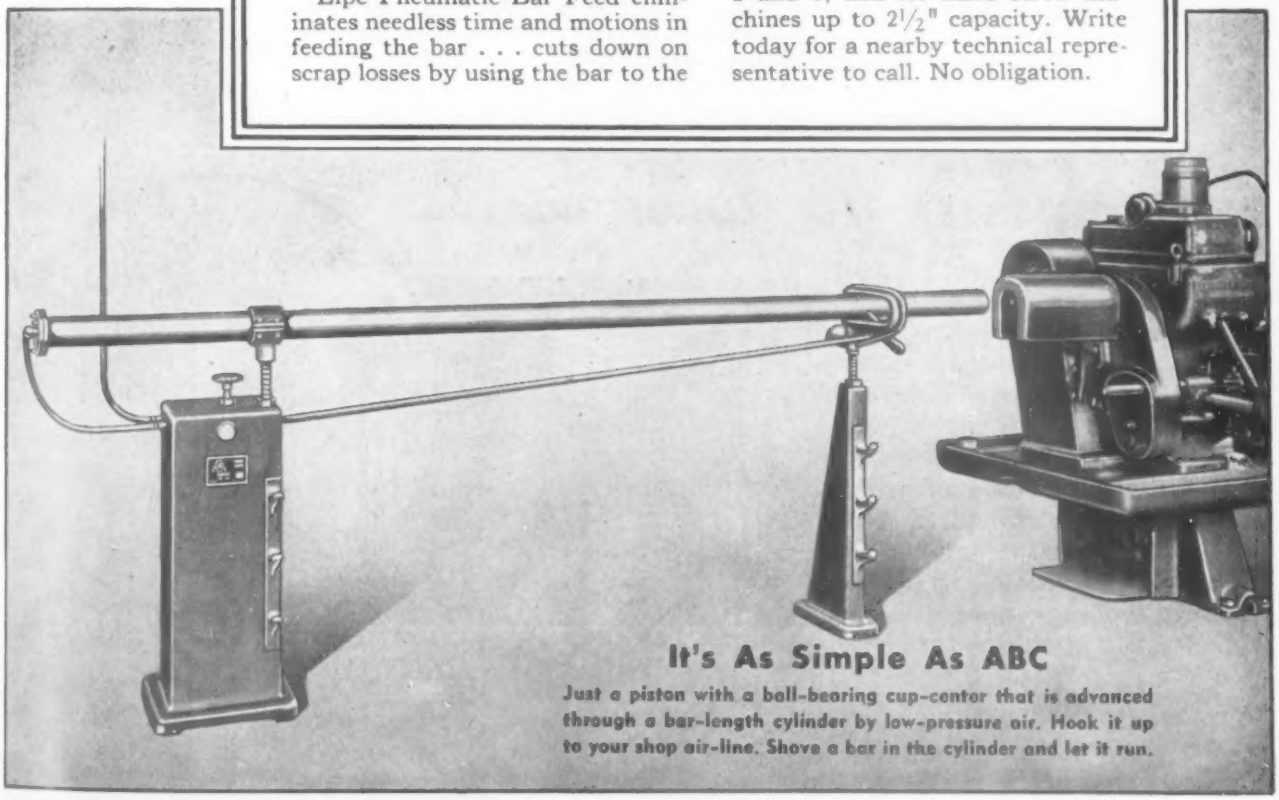
saves up to 20 minutes on a 12′ bar

The minutes which the Lipe Pneumatic Bar Feed will save you on every 12′ bar can be vitally important in speeding war materials to the fighting fronts today. But think what those same 20 minutes per bar will mean in the cost of your product *after the war*. Think what the lower-product-cost will mean to your salesmen when they are out fighting on postwar competitive fronts.

Saves Time, Motions, Materials

Lipe Pneumatic Bar Feed eliminates needless time and motions in feeding the bar . . . cuts down on scrap losses by using the bar to the smallest possible remnant . . . never feeds short . . . reduces rejects and refinishing by preventing scratched and marred pieces. You can use exact-size polished stock, thus doing away with one finishing operation. And the entire bar is inclosed —no whipping ends, no special guards required. No troublesome feed fingers and parts.

Works on any screw machine with fixed stop. Available for automatic screw machines Nos. 00, 0, 2 and 6, and for hand screw machines up to $2\frac{1}{2}$" capacity. Write today for a nearby technical representative to call. No obligation.



It's As Simple As ABC

Just a piston with a ball-bearing cup-center that is advanced through a bar-length cylinder by low-pressure air. Hook it up to your shop air-line. Shove a bar in the cylinder and let it run.

LIPE -ROLLWAY CORPORATION
SYRACUSE, N. Y.

Multiple Chuck

according to the manufacturer Aerco Corporation.

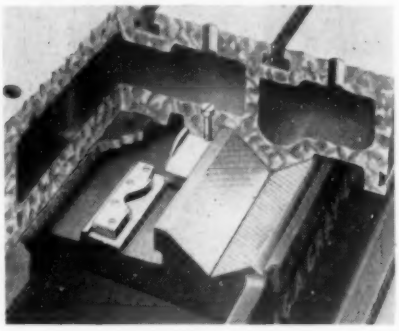
The chuck has two rows of five collets, permitting simultaneous milling of ten parts at one loading. The pressure for closing all collets simultaneously is provided by a few strokes of a hydraulic hand pump which builds up pressure to as much as 2,500 psi.

Although work is held rigidly and cannot turn or be pulled out during milling operations, pressure may be relieved instantly and the self-opening collets quickly reloaded. An adjustable depth stop makes it possible for the operator to quickly insert work pieces to the exact required length without the use of gauges or other methods.

STOP BLOCK IMPEDES RUNAWAY PLANER TABLE (N47)

G. A. Gray Co. announces that a device for stopping a runaway planer table after it has run off the bull gear is now a regular feature of its planers. The device also can be installed on planers now in service.

The braking device consists of cutting tools bolted to the bed at each end in position to engage stop blocks bolted to the under side of the table. In the event the motor drive fails to stop and reverse the table the tools cutting into the stop block bring the table to rest. The tools do not engage the block until the table rack has run off the bull gear, and are arranged so that cutting action



Planer Table Safety Stop

occurs on the side of the block avoiding upward thrust which might lift the table and damage the ways. After the stop has operated, it is desirable to replace the block and redress the tools.

INFORMATION FREE

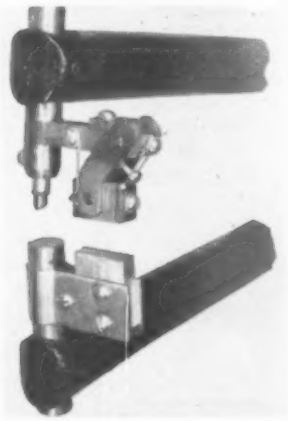
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

ATTACHMENT CONVERTS WELDER FOR BUTT WELDS (N48)

Conversion of a conventional spot welding machine for butt and T-welding operations is possible with a simple attachment developed by Commercial Platers and Manufacturers, Inc., according to a company announcement.

The attachment consists of two special electrodes which may be substituted easily and quickly for the regular electrode on the horizontal arms of a spot welder. Pieces to be welded are placed in guide grooves on the lower electrode. As the horizontal arms approach each other following depression of the regular pedal, the other special electrode clamps both workpieces in

(Continued on page 176)



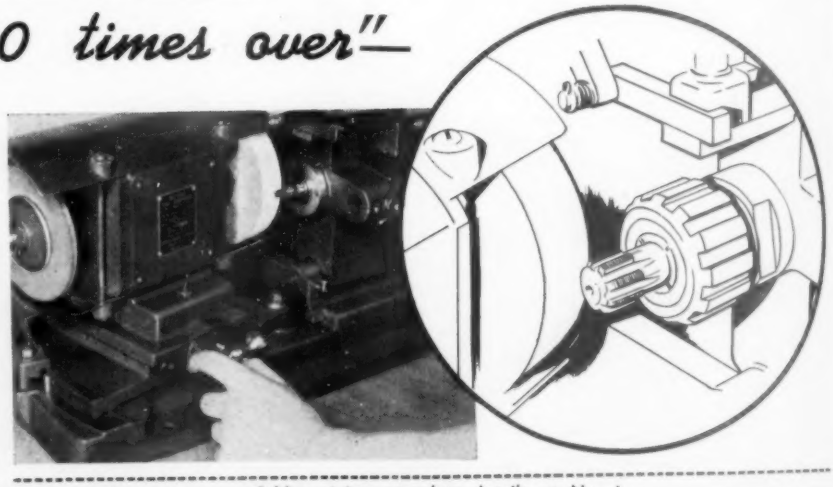
Spot Welder Converter

THE BLAKE TAP GRINDER

"PAID FOR ITSELF *10 times over*"—

Another of the country's leading manufacturers recently bought a Blake Tap Grinder. It has been running continuously—three shifts a day—sharpening the chamfer on stud bolt taps. "This unit has already paid for itself ten times over", is typical of the comments regarding Blake Tap Grinders. But you get other advantages, too—tremendously increased tap life—less work spoilage—fewer broken taps—less tap inventory.

The Blake is built in two models for taps No. 0 to 2" and up to 14" long. Either model will sharpen taps with 2, 3, 4, 5, 6, 8 or 10 flutes, right- or left-hand, without extra equipment.



Please send me your new folder giving complete details on No. 1 and No. 2 Blake Tap Grinders.

NAME..... TITLE.....

COMPANY .....

STREET .....

CITY..... STATE.....

T.E.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—L & D HIGH SPEED DRILL PRESSES—WALTHAM CUTTER SHARPENERS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS

TAPPING TIME IS ALL THE TIME

With WINTER Precision TAPS on the job. No down-time if you follow good, but simple tapping practice—sharp taps; plenty of lubrication; tap and hole in proper alignment and the right style of tap for the work to be done.

Add to Winter Precision TAPS made by skilled craftsmen, the Engineering Service Winter Brothers are equipped to give you, and your tapping operations should go through the shop in the shortest possible time, and with an output per tap of gratifying proportions.

TAP & DIE DIVISION of THE NATIONAL TWIST DRILL & TOOL CO.
Detroit, Michigan

Winter Brothers

COMPANY
BRANCH STORES

Wrentham, Massachusetts, U.S.A.
SAN FRANCISCO, CALIFORNIA · CHICAGO, ILLINOIS · DETROIT, MICHIGAN

place and holds the two in firm contact throughout the period of current application.

According to the company, such mechanical action of the electrode eliminates the time consuming operations ordinarily required in butt welding, insures accurate positioning of the pieces during formation of the weld, and avoids excessive metal flow around the weld. Butt and T-welds may be formed with stock up to ½".

QUICK-CHANGE PADS MAKE SANDER FLEXIBLE (N49)

Featuring a flexible sanding pad which detaches from the machine through a simple pull-out latch, a new electric portable sander has been developed by Sterling Tool Products Co. When different grades of abrasives are used on a job, pads loaded with grits of desired coarseness or fineness can be changed quickly and easily. Known as the Sterling 1000, the sander is designed to perform abrading jobs ranging from coarse sanding to lapping and finishing. Being flexible, the pad will conform to convex or concave surfaces of moderate curvature. Special pads for unusual contours also are available. Another feature of the machine is the non-vibrating action while the sanding pad is moving at a speed of 4500 oscillations per minute.

Flexible-Pad Sander

SYNTHETIC RUBBER CUT-OFFS PROVE PRACTICAL IN TESTS (N50)

A. P. deSanno & Son, Inc. announces that tests have proved its new Radiac synthetic rubber cut-off discs and grinding wheels to be superior in many respects to those made of crude rubber.

According to the company, specific data of tests made under actual operating conditions show that the synthetic rubber wheels and discs are advantageous for long wheel life, fast and free cutting, excellent finish, and little burn. The wheels have shown effective performance on wet grinding of ball bearing races and roller bearings. Synthetic cut-off discs have demonstrated fast-cutting qualities on cold-rolled and high-speed steels, roller bearing stock, glass rods, and tubing.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

Synthetic Rubber Abraders

Wheels and discs are manufactured in the standard range of thicknesses and diameters up to 20".

PNEUMATIC RIVETER DOES OWN BUCKING (N51)

Ingersoll-Rand Co. has announced a new air driven riveting tool which does its own bucking up by means of a yoke, thus requiring only one operator. The

(Continued on page 178)

Pneumatic Riveting Tool

Quick-As-Wink

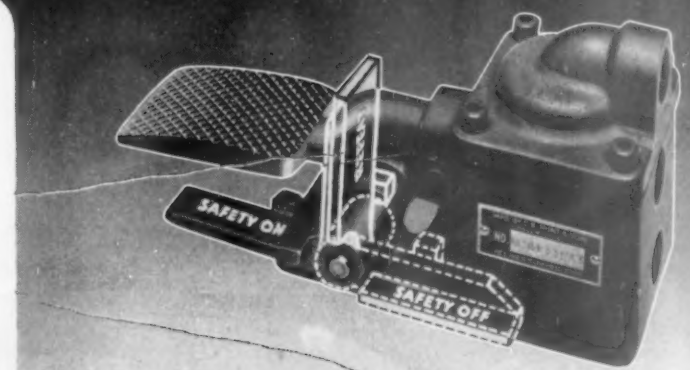
3-WAY-SINGLE-PEDAL

SPRING-RETURN AIR VALVE

Especially Adapted for Punch Presses, Forging Machines, etc.

When safety lock is in "On" position, valve is off and inoperative. In "Repeat" position valve is held open. Safety "Off" allows normal operation. All "ins" and "outs" are located in back of valve.

Send for 128-page catalog and data book of air and hydraulic valves.

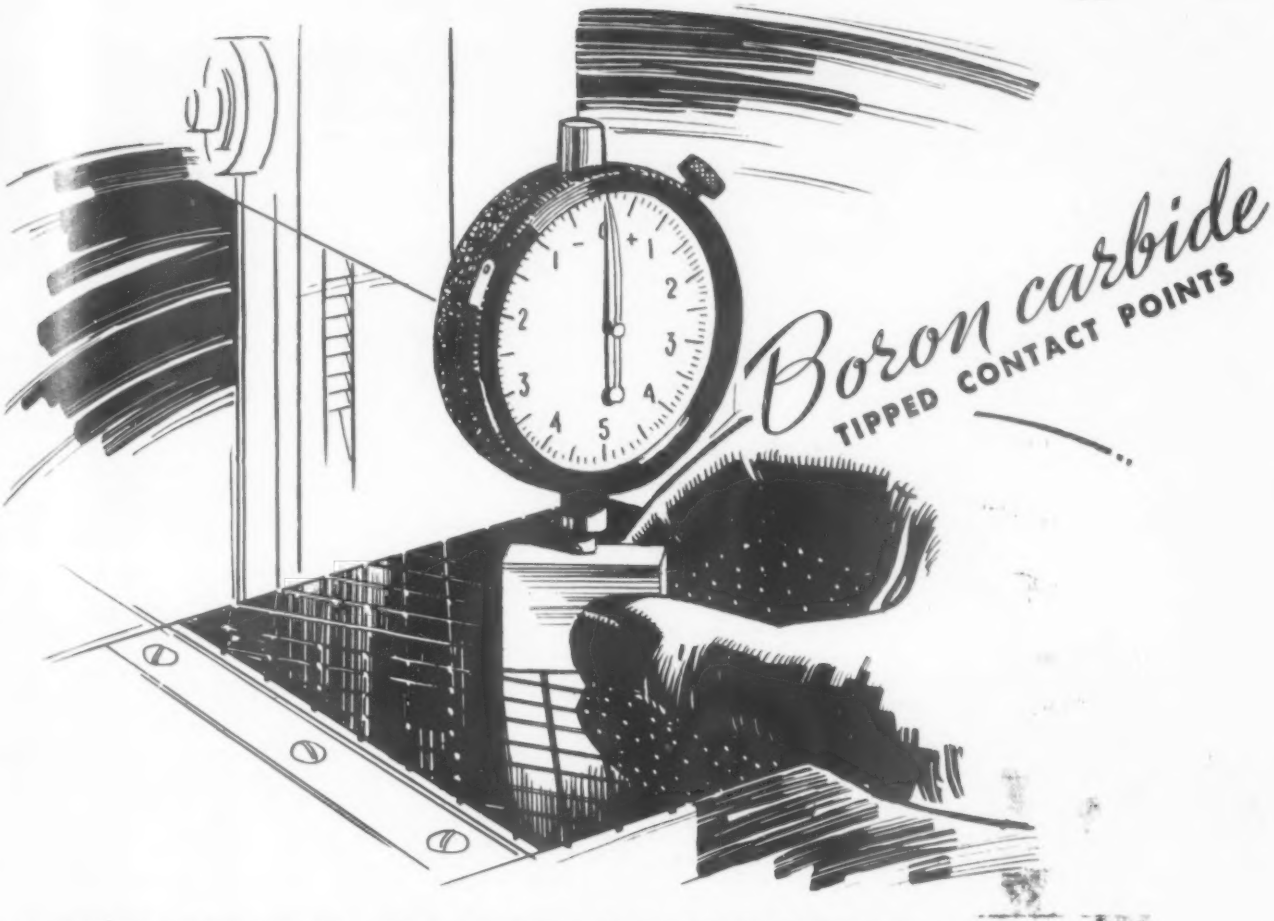


FOOT-OPERATED AIR VALVES ARE AVAILABLE IN THE FOLLOWING STANDARD SIZES: ⅜", ½", ¾", 1", 1¼", AND 1½". SPECIAL SIZES ON REQUEST.

C. B. HUNT & SON

1868 E. PERSHING ST. SALEM, OHIO

THE HIGHER THE PRESSURE THE TIGHTER THE SEAL — AIR WATER OIL



A TIP THAT CAN'T BE TOPPED, because

BORON CARBIDE will not charge—it will not scratch the work—it is the hardest material ever made by man for commercial use.

BORON CARBIDE is the perfect material for tipping contact points on dial indicators and other types of inspection equipment. Here is a material that offers long life, true measurements, and greatest economy.

BORON CARBIDE tipped contact points, made by New England, have a perfect mirror finish, and are made to exact specifications.

BORON CARBIDE is also ideal for tipping anvils, wear parts, surface plates, etc. It is truly a tip that can't be topped! Mail the coupon today for complete information on the New England line of contact points and anvils.

ALL KINDS OF CARBIDE TOOLS . DIAMOND TOOLS . DIAMOND POWDER

NEW ENGLAND CARBIDE TOOL COMPANY

Please send me folder covering the New England line of tungsten carbide, boron carbide and diamond contact points and anvils.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

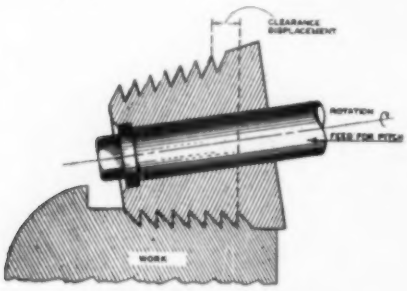
T. E.

60 BROOKLINE STREET • CAMBRIDGE 39, MASSACHUSETTS

riveter further simplifies riveting operations by driving the driven head to a predetermined height, which is adjustable, then automatically shutting off when this height is obtained. The company says the tool, designated as "Air-Buck", can be used to advantage wherever aluminum rivets up to 7/16" in diameter must be driven and where it is possible to use a yoke type tool. Yokes of different sizes are easily interchanged. A two-stage throttle enables the operator to align or inspect the rivet with a partial pressure before driving it home under full pressure.

THREAD MILLING CUTTER INCREASES PRODUCTION (N52)

Thread milling of straight sided dies in less time and to a higher degree of quality than practical with other production methods is possible with its new special taper type thread milling cutter, according to the Detroit Tap & Tool Company.



Taper Thread Milling Cutter

Cutter teeth engage the work parallel to the axis of the threads being formed but rotate in a plane inclined to the straight side of the thread. Inclination of the cutter at an angle equal to the taper of the cutter provides clearance for the straight side cutting face and results in even distribution of the cutting load over the full length of the tooth surface without any tearing action. A plain milling section of the cutter removes the incomplete thread at the outer edge.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

OPTICAL GENERATOR CUTS GRINDING COSTS (N53)

A new automatic grinder (optical curve generator) has been announced by the Optical Division of W. F. & John Barnes Co.

Use of the machine, incorporating use of diamond tools of suitable grit, will effect savings up to 75 per cent in time as compared with previous methods for rough and fine grinding optical flats and spherical lenses of all types and radii, according to the company. A semi-skilled operator can operate one or several machines and has only to insert the lens in the holder, press a button to start the cycle, and then remove the work when the machine has automatically shut off after the work is completed.

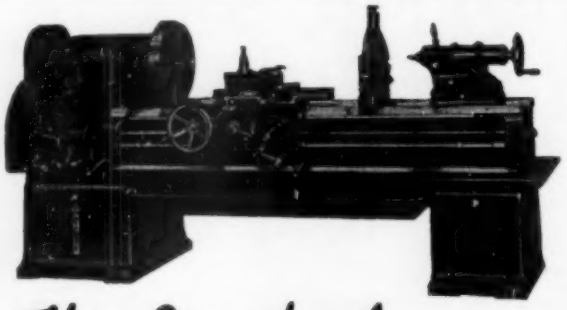
Optical Grinder

GAGE COMBINES SNAP AND DIAL FEATURES (N54)

Said by the manufacturer, N. A. Woodworth Co. to combine the best features of a roll snap gage and a dial indicator gage, a comparator type roll snap gage has been introduced under the name of "Limitrol".

The gage, which can be used either

(Continued on page 180)



The Braaford Metalmaster Lathe

★Throughout the metal-working industry, this lathe has an enviable reputation for dependability. Highest quality parts, assembled by skilled machine builders, make the Metalmaster a leader in the field of precision machine tools.

Also manufacturers of drilling and tapping equipment

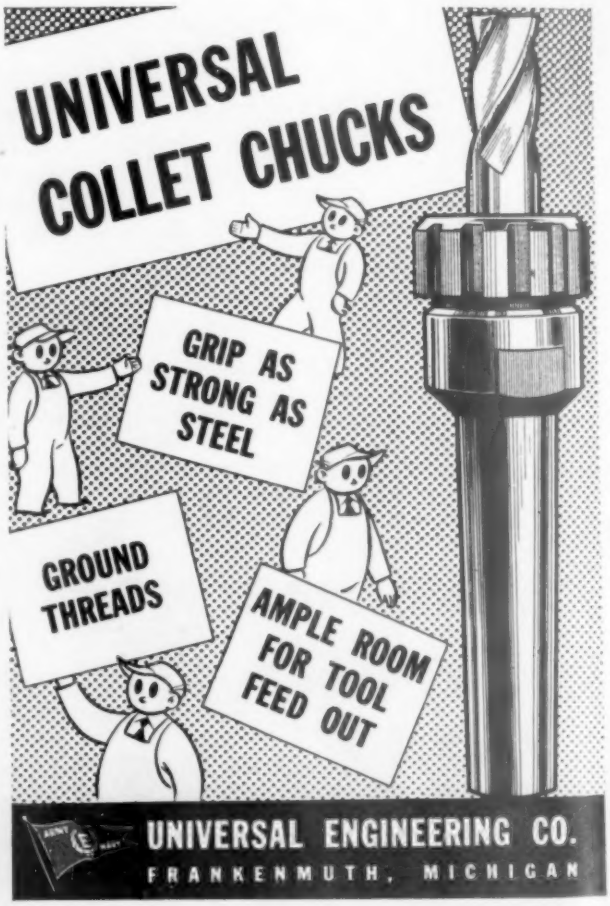
1840 - 1944

Bradford's experience in building metal-working machinery covers more than a century.

THE BRADFORD MACHINE TOOL CO.

EVANS STREET SOUTH OF EIGHTH CINCINNATI, OHIO

PRECISION TOOLS SINCE 1840



UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN

Taylor and White's great discovery which made possible high speed cutting was the greatest single development to help make mass production possible. The steel developed, commonly known as 18-4-1, served industry faithfully for over thirty years without a serious competitor.

In the early 1930's the first molybdenum high speed steels were used on a substantial commercial basis and, before the Second World War, about 25% of all tungsten high speed steels had already been replaced by molybdenum high speed steels on merit. This steady progress of logical replacement of the tungsten steels was interrupted by the war because of the tungsten shortage, when many industrial plants were forced to a sudden change to molybdenum steels.

Because of the stress of war production many concerns have never had an opportunity to satisfy themselves thoroughly as to the comparative merits of the molybdenum high speed steels. For those, in this category, who are inclined to return to the tungsten steels, we suggest a serious consideration of the following facts—molybdenum high speed steels perform as well as, or better than, tungsten steels—and they cost less.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

... with parts of wear-resisting

Ampco Metal

To avoid costly failures and breakdowns in equipment you build or buy — now or post-war — it pays to specify Ampco Metal for parts subject to wear, impact, or corrosion. Ampco Engineering Data Sheets illustrate dozens of applications of this remarkable alloy of the aluminum bronze class —which lasts several times as long as ordinary bronze. Here is the condensed experience of over 2000 users in war and peace.

A-2

Ampco's nation-wide organization of field engineers is available to help you solve your problems of metal failure.

Reg. U. S. Pat. Off.

AMPCO Metal

The Metal without an Equal

AMPCO METALLURGICAL SPECIALTIES

Ampco Grades 12 to 22 (special alloys of the aluminum bronze class) . . . Ampcoloy (general industrial bronzes) . . . Special Custom Copper-base Alloys.

•

Sand Castings . . . Centrifugal Castings . . . Extruded and other Wrought Products . . . Precision-machined Parts . . . Ampco-Trode (coated welding electrodes) . . . Ampco Non-Sparking Safety Tools.

Valuable Data Free for Builders and Users of: Machine Tools . . . Aircraft . . . Pumps and Valves . . . Engines . . . Ordnance . . . Ships . . . Heavy Machinery . . . etc, etc.

Write today on your business letterhead, or tear out and mail coupon.

AMPCO METAL, INC.
Dept. TE-4, Milwaukee 4, Wisconsin
Please send File 41 of Selected Engineering Data Sheets, copy of Catalog 23, and special data sheets on

_____

_____

Name_____ Position_____

Company_____

Address_____

City_____ (_____) State_____

—NEW EQUIPMENT—

Dial Snap Gage

as a hand or bench type gage, performs six inspection operations in one—it checks pitch diameter, lead, taper, angle, straightness, and out of roundness. It is manufactured with both plain and threaded rolls, is easy to operate, and is available in both open and closed end models. The gage is available in ¼", 3/16", ½", 5/8", ¾", and ⅞" sizes, each being adjustable ⅛" either way from the nominal size.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

CUTTER DESIGN PERMITS INTERIOR LUBRICATION (N55)

High operating speeds and close limits of accuracy in machining operations are possible through improved

Lubricated Cutter

design of its outside deburring cutter, according to Severance Tool Industries, Inc.

Incorporation of a coolant hole in the outside of the deburring cutter for use on automatic screw machine and turret lathes in which the tool is stationary and the work revolves, permits

(Continued on page 182)

Where you Can't take a Chance

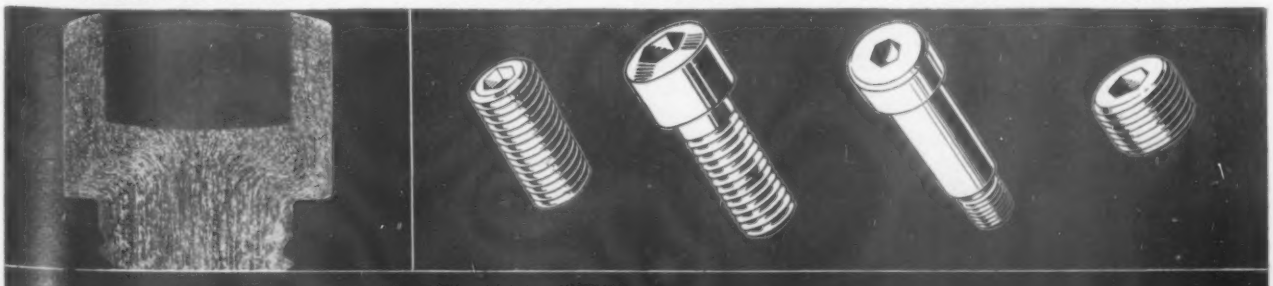
use PARKER-KALON SOCKET SCREWS

WHEN you specify Parker-Kalon Cold-forged Socket Screws, you get unusual protection against "doubtful" screws — screws that *look* all right, but which fail to *work* right.

Accuracy, strength, and uniformity are predetermined by Parker-Kalon's unequalled Quality-Control routine, in which every mechanical and physical characteristic of the screws is carefully checked. Tests and inspections cover Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head and Socket Size and Position; Thread Fit.

Specify PARKER-KALON next time you order Socket Screws . . . and be sure of getting screws that can "take it"! They cost no more. Parker-Kalon Corporation, 190-198 Varick Street, New York 14, N. Y.

COLD-FORGED FOR STRENGTH | SET SCREWS | CAP SCREWS | STRIPPER BOLTS | PIPE PLUGS



A Product of **PARKER-KALON**--*Specialists in Fastening Devices*

YOU HARDEN IT—WE'LL DRILL IT

"Hardsteel" Drills

SPEED THE DIES FOR THE WINGS OF TOMORROW

"HARDSTEEL" drills in thousands of plants are speeding die production—drilling hardened dies when last minute engineering changes call for holes in new locations or for additional holes—saving both critical materials and countless man-hours.

For fast, accurate drilling of steel hardened by any process to Rockwell "C" 40 or harder, there is only one answer—"HARDSTEEL," the three-cornered drill made from a special alloy material that can be reground quickly on any wheel.

"HARDSTEEL" is also available in reamers, tool bits and special tools. These tools are setting excellent production records on tough, hard-cutting steels and abrasive non-ferrous alloys.

Complete data on "HARDSTEEL" tools is contained in the "HARDSTEEL" Operator's Manual, together with instructions for using and many illustrations showing both parts recovery and production operations. Copy free on request.

BLACK DRILL COMPANY
1400 EAST 222nd STREET • CLEVELAND 17, OHIO

"HARDSTEEL"
DRILLS · REAMERS · TOOL BITS · SPECIAL TOOLS

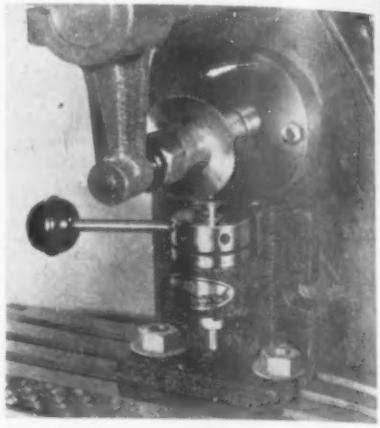
a proper flow of lubricant to the working surfaces, the company states. The hole is located in the side of the cutter so that the flow of coolant is from the inside of the cutter across the cutting teeth, cooling the work.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

CHUCK REDUCES NEED FOR SPECIAL FIXTURES (N56)

Engineered to eliminate the constant building and improvision of jigs and fixtures in tool rooms, a new machine



Micro-Chuck

tool accessory known as Micro-Chuck, has been developed by the Micro-Master Products Co.

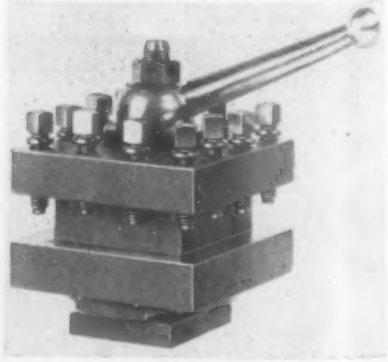
Said by the manufacturer to eliminate need of building special jigs and fixtures, the chuck is designed to handle all No. 00 size collets and to accommodate work 1/16" to 3/8" round, 3/32" to 7/32" square, and 3/8" to 1/4" hexagonal. It also will handle all standard removable drill bushings from No. 54 (.055") to 5/32" drill sizes.

TOOL POSTS DESIGNED FOR HEAVY DUTY (N57)

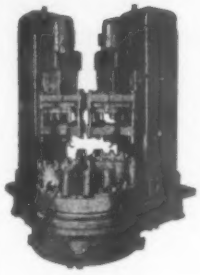
Two new heavy duty model turret tool posts have been announced by Enco Mfg. Co.

Designated as Model HD-1 and HD-2, they are designed for large lathes and heavy duty work where extreme rigid-

(Continued on page 184)



Heavy Duty Tool Post



Now is the time to have SNYDER plan with you for economical production to win customers

SNYDER KNOWS HOW

This machine for reaming leg holes in aircraft crankcase sections, illustrates the adaptability of Snyder standard drilling machines to special machine applications—at a saving of several thousand dollars as compared to the cost of building a special machine for this work.

Two Snyder 10 V 18 standard drilling machine column assemblies are mounted upon a special base. Four fixtures are mounted upon a 60° diameter table with mechanical Geneva index. Spindles on the 9-spindle multiple heads are ball-bearing mounted and equipped with oil flingers.

Work-cycle is semi-automatic. First two indexes complete first nine holes. At third station, work is inverted, reloaded and again indexed through both work stations to complete reaming the second nine holes in the housing.

Two factors are of supreme importance in your postwar plans.

First, is being ready ON TIME to get in on the tremendous postwar buying wave. The foresighted are working *now* on designs for production machines to be built as soon as existing restrictions are lifted.

Second, is being ready with a product so thoroughly acceptable in performance and price that it will not only hold original markets but expand and multiply them.

This will require machines which automatically maintain specified tolerances and finishes in one or many automatic-cycle operations, reduce handling and fatigue and automatically maintain a production rate which brings unit costs down to the level of the broadest markets.

With 20 years experience behind it and excellent plant facilities, the Snyder organization is well qualified and fully equipped to design and build the special-purpose machines you will require.

This experience covers special-purpose machines for many types of industry, processing a wide variety of civilian and military products. The knowledge gained in solving these many production problems can be of great practical value to you when applied to your own.

The Snyder Engineering Staff is ready to consult with you *now* regarding your product, production objectives, cost factors and the coordination of new production units into existing facilities.

We invite you to write us in full confidence. *Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Michigan.*

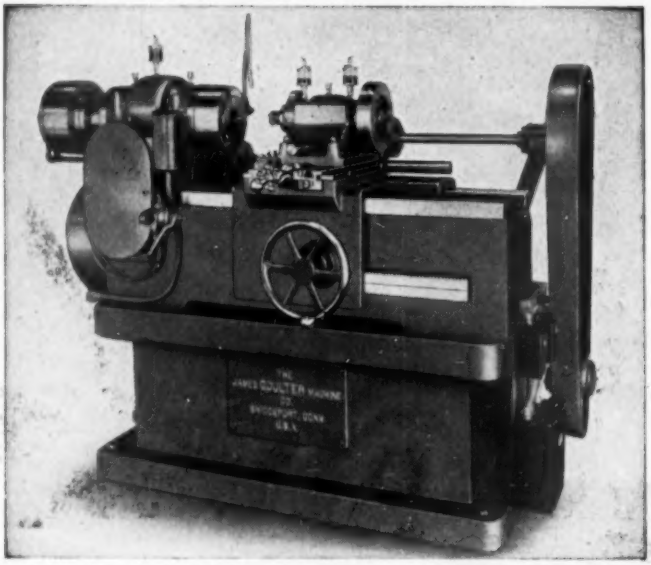
PLAN Your PRODUCTION
when you
PLAN Your PRODUCT

SNYDER
DESIGNERS AND BUILDERS OF SPECIAL-PURPOSE MACHINES FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Co-operation with Leading American Industries

PRECISION THREAD MILLER

FULL AUTOMATIC CONTROL



INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT

The James COULTER Machine Co.
BRIDGEPORT • CONNECTICUT • U. S. A.

Talk About PRODUCTION Without DIES!

"Enclosed pictures in our plant prove the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on request)

4,000 Parts Per Day with DI-ACRO Bender

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines,—Benders, Brakes, Shears. Picture below shows an acute right angle bend and photograph above shows the finished part formed to die precision. Women operating DI-ACRO units maintain a high out-put on production work.

Send for CATALOG

showing DI-ACRO Precision Machines and many examples of parts made with "DIE-LESS DUPLICATING."

"DIE-LESS" DUPLICATING
The DI-ACRO System of METAL DUPLICATING Without Dies
DI-ACRO
DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.
307 EIGHTH AVENUE SOUTH · MINNEAPOLIS 15, MINNESOTA

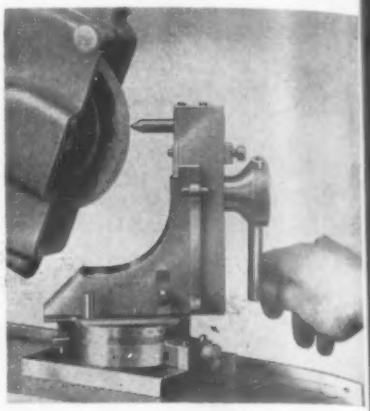
ity and accuracy in the tool post are required. Both have 12-position indexing, permitting three different working positions for each tool.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

NEW WHEEL DRESSER ELIMINATES CHATTER (N58)

Chief feature of the new radii and angle dresser, introduced by I & S



"Fluid-motion" Wheel Dresser

Tool Company, is its "Fluid-motion" wheel dressing.

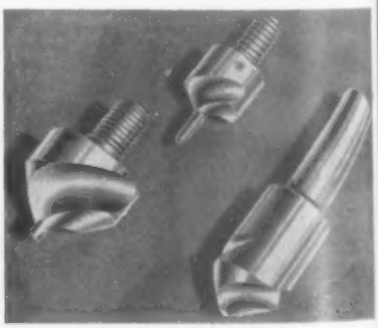
According to the company, this feature eliminates chatter and leaves the form clean, precise, and free of chatter marks or tool marks caused by tension and machine vibration.

Other advantages cited are accuracy to .0001", 14" wheel capacity, large radii range, one setting per form, dustproof construction, and easy operation.

NEW COUNTERSINKING CUTTERS AVAILABLE (N59)

A new line of precision countersinking cutters for use on all types of countersinking machines and devices has been introduced by Farnham Mfg Company.

Although the cutters originally were made for highly restricted aircraft production only, greatly expanded manufacturing facilities now make them available for all types of countersinking. They are available in a wide range of sizes from 3/8", 1/2", 5/8", and 13/16" body diameter. THE END



Precision Countersinkers

13 minutes per cut of 4¾"... and 70 cuts per saw!

... with SIMONDS Metal Bands

For straight cuts, or for contour sawing, Simonds Hard Edge Metal Band Saw Blades stand up longest... cut with greatest smoothness and accuracy... delivering performance such as that cited above, *which was a competitive test on SAE 1035 steel.* This is assured by even tooth-set on both sides of blade, by correct milling of teeth, and by automatically controlled hardening of the alloy blade. Finally, joints are welded for utmost strength.

This extra quality means accuracy that saves the time and expense of many milling and shaping operations. Have your industrial supply distributor bring a Simonds Cutting Engineer to survey your metal-bandsawing operations—and see what he can do to step up output and blade-life.

1350 Columbia Rd., Boston 27 • 127 S. Green St., Chicago 7 • 228 First Ave., San Francisco 5 • 311 S. W. First Ave., Portland 4, Ore. • 520 First Ave. So., Seattle 4, Wn.

SHORTEN THE WAR BUY BONDS!

BUY BONDS!

SIMONDS

SAW AND STEEL COMPANY

FITCHBURG, MASSACHUSETTS

PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

Your Tapping Questions

When should I use a two-flute tap?

What is meant by per cent of thread?

Is the type of cutting oil important?

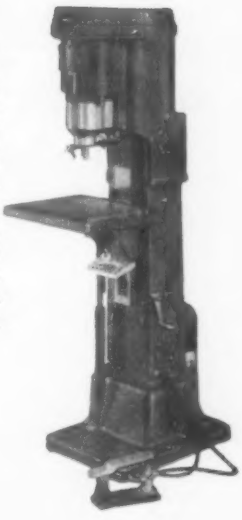
How much chip clearance should I allow in a blind hole?

How can I get more tap life?

Which holding fixture?

Answered

These are some of the more common questions we answer almost daily. Precision tapping is a science in itself, and even an experienced operator will occasionally run into a snag—some new problem on which he can use a little outside help. When you reach that point—call on us. Our engineers are trained in the field. Draw on their experience and knowledge to reach a solution to your problem quickly and easily. Write for our catalog on Precision Tapping at High Speed. Send your questions to R. G. Haskins Co., 2756 West Flournoy Street, Chicago, Illinois.



HASKINS highspeed TAPPING MACHINES

HASKINS

haskins

PRECISION TAPPING EQUIPMENT

NEW LITERATURE

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

OF INTEREST TO PRODUCTION EXECUTIVES

(998) Machine Tools

Onsrud Machine Works, Inc. has just issued a new catalog containing every machine and tool manufactured by the company. Of pocket size, it contains complete description of both nonferrous metal and wood-working machines, tools, and cutters.

(999) Carbide Tools

Designated in **Bulletin No. 144**, a new circular showing latest prices on Willey's Metal and Tools, has been issued by Willey's Carbide Tool Co.

(1000) Pumps

Designed as a reference book for machine tool builders and pump users, an 80-page **Pump Engineering Manual** has just been published by Pioneer Pump and Mfg. Co. It describes and illustrates all pump models made by the company, and tells how to determine the size of pumps, how to make proper pumping installations, and how to determine pump capacity requirements.

(1001) Rubber Abrasives

Weldon Roberts Rubber Co. announces a new catalog containing prices and dimension tables on its Brightboy line of wheels and rods for use on grinders, lathes, presses, and polishing machines, and blocks with flat and curved surfaces for metal parts to be worked by hand. Speed tables and other helpful production information are included.

The company also has available a specially prepared leaflet entitled **"Methods and Applications"** outlining various production procedures and short cuts.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1002) Metal Treating

A 28-page bulletin entitled **"Holden Neutral Baths For Hardening and Tempering"** has been issued by The A. F. Holden Co.

In addition to discussing hardening procedures, it covers supervision and control, analysis, demetalizing, tempering baths, and bath recommendations.

(1003) Collet Chucks

Erickson Steel Co. has issued a booklet on its precision collet chucks for use on drill presses, lathes, milling machines, screw machines, portable electric and air drills, and similar equipment. It contains sectional drawings showing the construction of the chuck, together with illustrations of its applications for various machinery operations.

(1004) Metal Punching

Wales-Strippit Corp. has just published a new catalog, designated as **"PS,"** describing and illustrating the Wales Plate Set System for hole punching. The catalog explains what the system is, how it operates, and describes the plate sets, punch assemblies and dies, and feed carriages.

(1005) Cutter Maintenance

The Cincinnati Milling Machine Co. has issued a booklet containing two articles covering advanced methods in cutter sharpening. One article deals with grinding milling cutters with resinoid bonded wheels. It describes in detail the process of material re-

(Continued on page 188)

PIONEERS

IN THE MANUFACTURE OF

INSERTED-BLADE

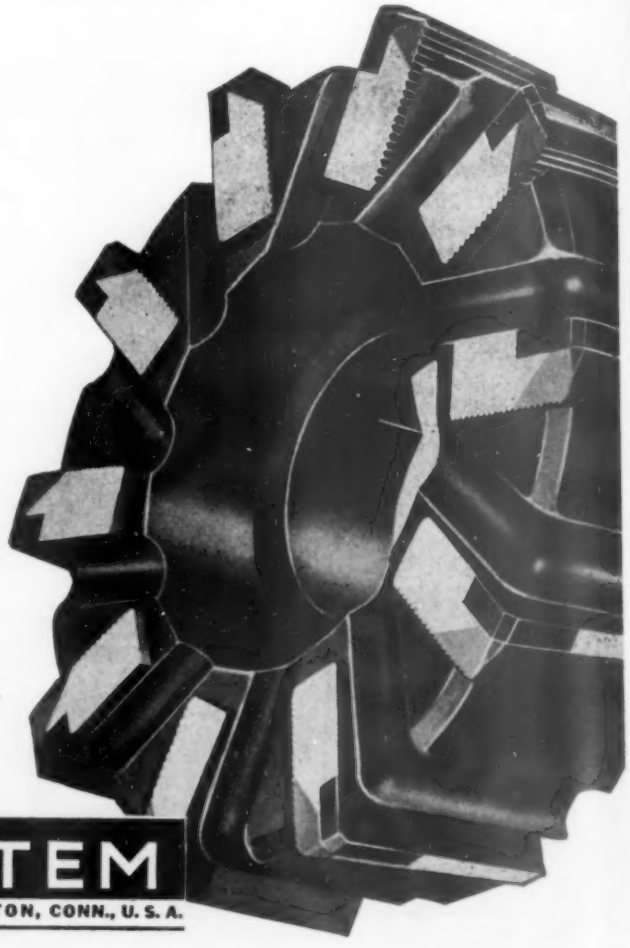
NEGATIVE RAKE AND SPIRAL

MILLING CUTTERS

for Machining Steel at High Speeds

The O K Tool Co. not only originated Inserted-Blade Milling Cutters, but also pioneered the successful adaptation of these cutters to negative rake and spiral milling.

This type of milling—a "shearing" cut from rear to point of blade which leaves a high finish on steel—requires extremely rugged construction, both in cutter and in set-up. Extreme rigidity and strength are outstanding characteristics of O K Inserted-Blade Milling Cutters, due to the high grade material and to the positive locking mechanisms employed.



INSERTED-BLADE METAL CUTTING

TRADE OK MARK TOOL SYSTEM

MANUFACTURED ONLY BY THE O K TOOL COMPANY, SHELTON, CONN., U. S. A.

You get all these Great Features in SKILSAW DRILLS!

1. Die cast aluminum bodies for lighter weight, greater strength!
2. 100% anti-friction bearing construction eliminates vibration!
3. 100% overload capacity switch for trouble-free operation.
4. Extra capacity motor for fastest drilling, longest life.
5. Helical cut gears of finest steel for quiet, smooth operation.

• Model "64" SKILDRILL —⅜ in. heavy duty drill with 100% anti-friction bearing construction. Perfect for close-quarter drilling . . . pipe handle is detachable.

• Model "80" SKILDRILL —the lightest, most compact ½ in. electric drill made. Weighs only 8 lbs., overall length 11½ inches. Pipe handle is detachable.

• Model "45" SKILDRILL—capacity ¼ in. in steel, ½ in. in wood. Weighs only 2¾ lbs. Fits the palm of your hand easily.

It's no wonder SKILSAW DRILLS are preferred in all industry . . . *they stand the gaff!* They've got the extra power that means top load speed on all drilling, boring and reaming jobs. They've got the *perfect* balance and compactness that means easier handling in any position. They give you greater output per man with less effort!

And SKILSAW DRILLS cost less to operate because they're *quality-built throughout* to stand up under today's round-the-clock production schedules!

Ask your distributor for a convincing demonstration of SKILSAW DRILL superiority today! Most models are available from his stock.

SKILSAW, INC.
5041 Elston Ave., Chicago 30, Ill.
Sales and Service Branches in All Principal Cities

ARMY E NAVY

PLANNING FOR AFTER-THE-WAR?
Let Skilsaw Field Engineers help you now to plan "tooling-up" for peacetime production with Skilsaw's new post-war tools.

SKILSAW PORTABLE ELECTRIC TOOLS

MAKE AMERICA'S HANDS MORE PRODUCTIVE

moving and superfinishing and is said to represent the first successful application of resinoid bonded wheels to every phase of high speed steel cutter grinding.

The second article entitled "Making Carbide Tipped Flat Boring Cutters," contains photographs and drawings illustrating the various steps in the manufacture of tools used in horizontal boring machine spindles. The company also has available a booklet entitled "Cutter Sharpening Practice" which is available upon request. It is designated as publication **No. M-1245.**

(1006) Metal Cutting Machinery

Grob Brothers have published a new catalog with descriptions of its sawing, filing and lapping machines. It contains descriptions and specifications of the company's various band saws, filing machines, lapping machines, butt welder for saw blades and band saw blades.

(1007) Electric Hand Tools

Precise Products Co. has available a booklet entitled **"Facts and Figures"** describing high speed electric hand tools and what they do. Particularly it describes and illustrates the company's Model 35 electric hand tool including applications for light production jobs, such as deburring holes and slots, smoothing corners, finishing grooves, and deburring inside of tubing.

(1008) Diamond Tools

Wheel Trueing Tool Co. has just released booklets 3 and 4 of a series now being prepared on the complete line of diamond tools manufactured by the company. Booklet No. 3 illustrates and describes the complete line of drill bits, and No. 4 is devoted to the subject of radius forming diamond tools.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1009) Boring Mills

Devoted to descriptions and illustrations of its line of 54-inch, 64-inch, 6-foot, 7-foot, and 7-foot widened to 8-foot vertical boring mills, a publication has just been issued by the Cincinnati Planer Co. It describes in detail various component parts of the machines and lists basic features and machine capacities.

(1010) Work Holder

Metro Vise Co. has just issued a new folder dealing with its new Metro Positioner, a tool for mounting work rigidly at any angle. It describes how the tool is used for holding clamping work during operations such as checking, milling, drilling, shaping, boring, welding, filing, pattern-making and similar work. The folder, contains many illustrations, and lists standard sizes and specifications.

(1011) Speeds and Feeds

National Twist Drill & Tool Co. has issued an engineering bulletin, known as **No. 198,** giving speed and feed calculations for milling cutters and other rotating tools.

The company has also issued **Bulletin No. 199,** listing a table of cutting speeds for drills, reamers and milling cutters. Both bulletins are one page sheets punched for insertion in a 3-ring binder and are set up in easy-to-read chart form.

(1012) Metal Finishing

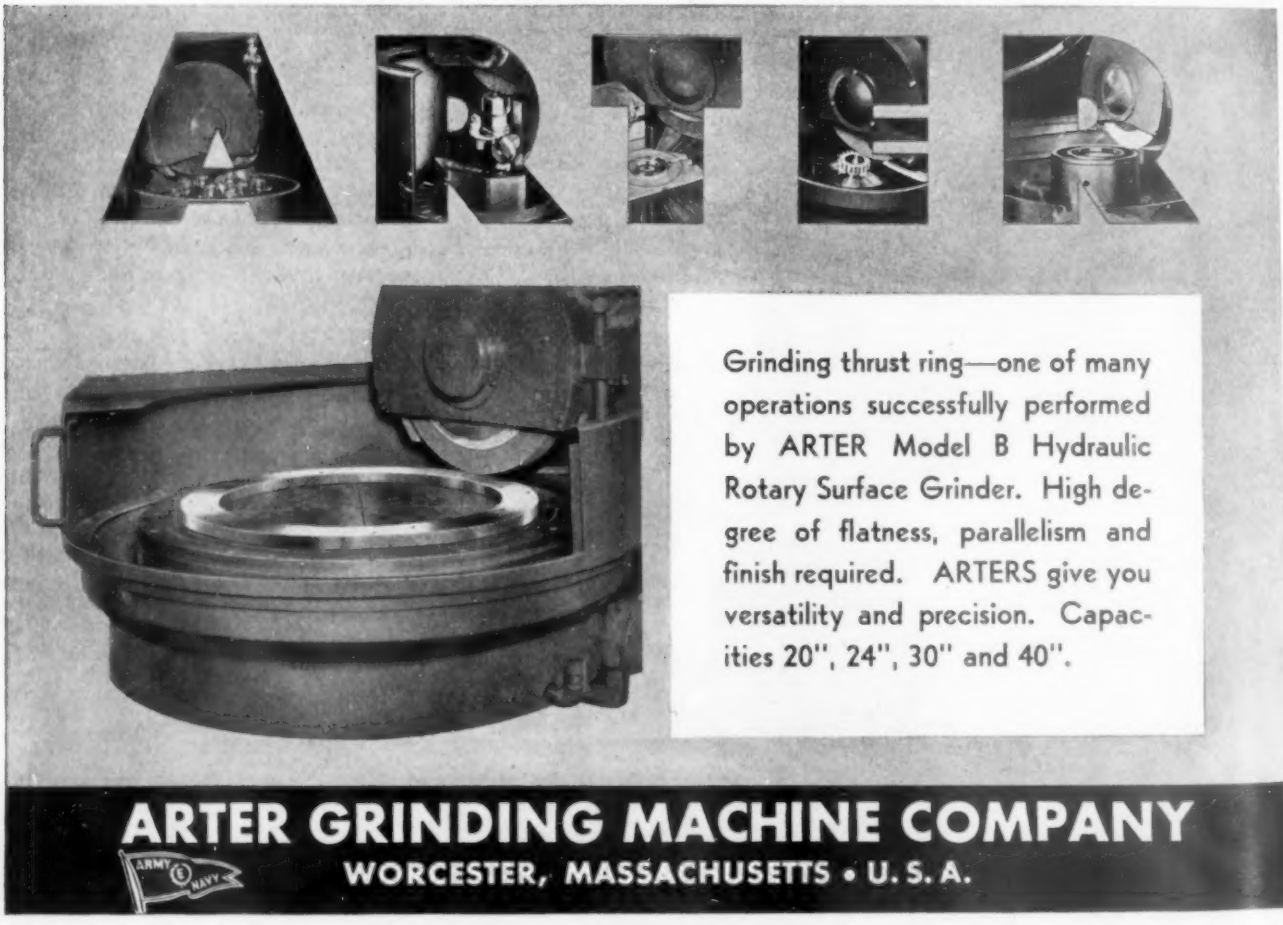
A new 8-page bulletin, designated as **No. 17** and entitled **"A Study of Friction, Galling, and Seizing,"** has been published by the Meehanite Research Institute of America, Inc.

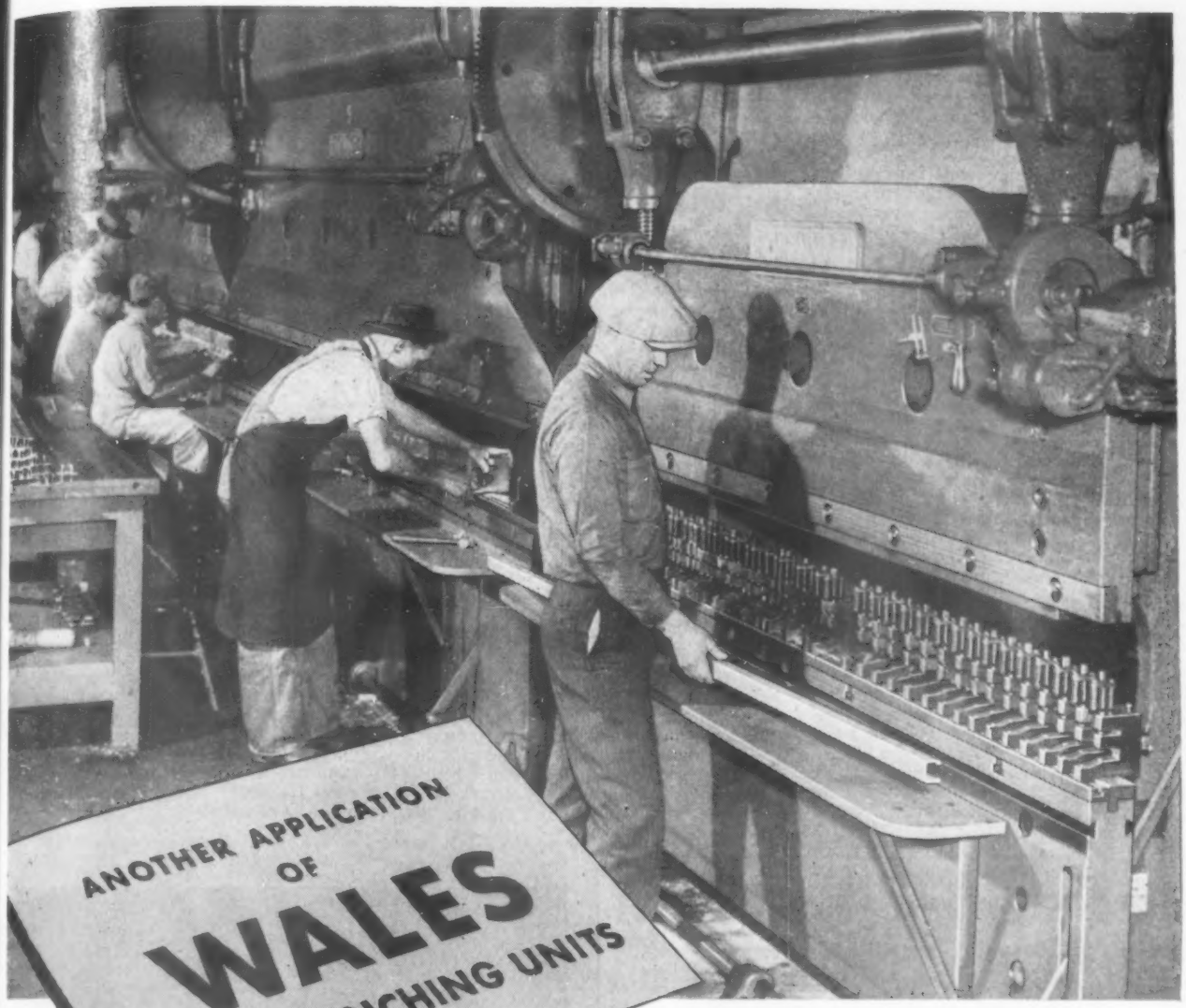
Developed as a result of recent researches into the problems of galling, seizing, and scuffing of metal surfaces in contact with one another, the booklet contains information on these problems and a complete description of the test methods used. The results of the tests are charted and conclusions are tabulated.

(1013) Screw Products

Aluminum Company of America has just issued a new catalog listing its aluminum and aluminum-alloy standard screw products. The catalog lists complete data on the company's machine screws, bolts, nuts, washers, and rivets. It contains a section dealing with mechanical properties, wrought

(Continued on page 190)


ARTER
Grinding thrust ring—one of many operations successfully performed by ARTER Model B Hydraulic Rotary Surface Grinder. High degree of flatness, parallelism and finish required. ARTERS give you versatility and precision. Capacities 20", 24", 30" and 40".
ARTER GRINDING MACHINE COMPANY
WORCESTER, MASSACHUSETTS • U. S. A.



IN METAL FABRICATION

Punching holes in stringers up to 40 feet in length is no longer an obstacle in metal fabrication.

Above illustration shows 3 press brakes side by side equipped with Wales Type "E" Hole Punching Units which will punch holes simultaneously along the entire length of stringers. This is another example of the wide application of Wales Hole Punching Units.

Often, many valuable hours, days, weeks, and sometimes months of important engineering and development time have been needlessly devoted to designing and building special hole punching dies when Wales-Strippit engineers have already solved the problems by using various adaptations of standard Wales Hole Punching Units.

That is why leading metal fabricators are following the timely suggestion of investigating Wales Hole Punching Units before putting holes in channels, angles, and sheets by *any method*.

In addition to all the time-saving, money-saving advantages for standardizing on Wales Hole Punching Units, it pays to keep posted on all the latest Wales-Strippit developments because, "There's Always Something New in the Wales Line."

Write for Catalogs Today.

FEATURES

Usual time-consuming adjustments of conventional set-ups are eliminated.

Punch and die held in perfect alignment by holder.

Each unit is independent and self-contained.

Straight line, staggered and scattered patterns punched with same units.

Same group of units may be used interchangeably on press brakes and stamping presses.

Nothing is attached to press ram.

Individual units may be instantly removed or reset.

Punches may be interchanged without disturbing set-up.

Die setting and press "down time" reduced to minutes.

Same units may be used and reused in unlimited patterns.

WALES-STRIPPIT CORPORATION

GEORGE F. WALES, *President*

353 Payne Avenue **NORTH TONAWANDA, N. Y.**

(Between Buffalo and Niagara Falls)

Specialists in Punching and Notching Equipment

aluminum alloys, strength for driven rivets, and government specifications. Also given are screw thread data and capacities and facilities for special parts.

(1014) Reamers

Wetmore Reamers and Boring Bars. Wetmore Reamer Co. This new catalog covers the company's complete line of adjustable, inserted blade reamers, boring bars, and special tools. It also contains other data and information designed especially for production executives and engineers.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1015) Commercial Laboratories

The American Council of Commercial Laboratories has published a directory listing the leading independent, testing, research and inspection laboratories of America. The directory aims to furnish business and government executives, as well as other persons with information concerning the activities of independent laboratories and the advantages to be derived from utilizing their services in the solution of engineering, testing and inspection and other production problems.

NEW BOOKS

Hand Tools, 174 pages, written by Albert M. Wagener, instructor in shop theory price $1.75 at the Ford Trade School and Harlan R. Arthur, supervisor of Instruction for Naval Training School at Dearborn, Mich. Published by D. Van Nostrand Co., Inc. 250 Fourth Ave., New York City.

Primarily a hand tool primer, this book seeks to acquaint the reader with a fundamental working knowledge of shop nomenclature and procedure. It discusses rules and scales, dividers and calipers, the combination square, screw and wire gages, miscellaneous semi-precision tools, micrometers, vernier gages, indicators, specialized precision tools, shaping, forming and marking tools, turning and gripping tools, tools for holding work at a bench, miscellaneous holding devices, hole forming tools, machine cutters and their holders, miscellaneous tools, and types of fasteners.

The book is particularly well organized so far as logical sequence is concerned, and profuse illustrations lend a helping hand with the text. Another excellent feature is that it contains many little technical tips and kinks that can serve to save the novice shop worker trouble and embarrassment.

The book might be criticized for not dealing extensively enough with all the items covered, but since its declared purpose is to acquaint the initiate only with fundamentals, this criticism hardly is valid.

Lubricants and Cutting Oils for Machine Tools, 90 pages, John Wiley & Sons, Inc. 440 Fourth Ave., New York City. Price $1.50.

Written by William G. Forbes and designed to serve as a compact package of practical information on lubrication problems that arise in metal cutting, this book explains fundamental principles of lubrication in relation to metal cutting and the application of various types of cutting oils to machine tool operations.

The book reviews the principles of machine tool lubrication from the standpoint of practical maintenance. Chapters are devoted to the following subjects: Description of standard laboratory tests carried out on new and used oil, composition of greases, different types of machine tools, machine tool lubrication and maintenance, mechanics and metal cutting, composition of cutting oils, compounds and blends of cutting oils, practical application of cutting oils, tool design and machinability tables, and prevention of skin diseases that result from contact with lubricants. The book has been adapted in part from the author's more detailed book entitled "**Lubrication of Industrial Marine Machinery**", which contains more complete information on many of the subjects discussed in "**Lubricants and Cutting Oils For Machine Tools.**" The book is written in simple, and easily understood language.

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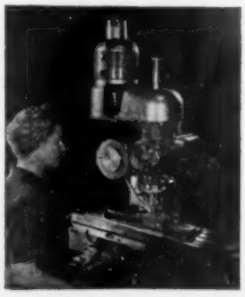

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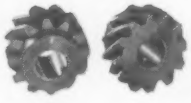

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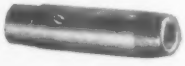

Cast Iron Valve Stem Guide. ½ to one thousandth removed —220 pieces per hour. Better finish and straighter hole.

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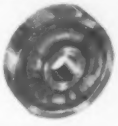

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

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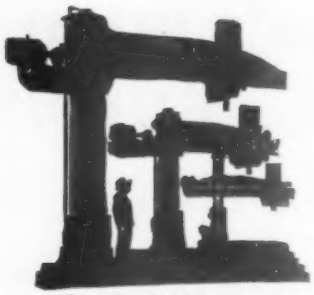

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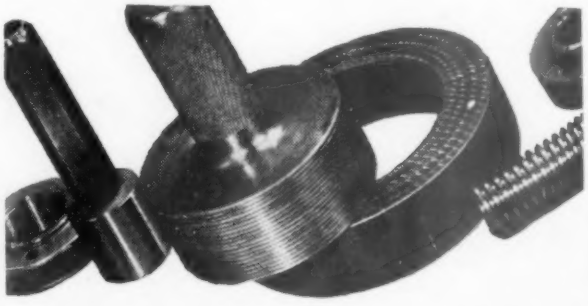

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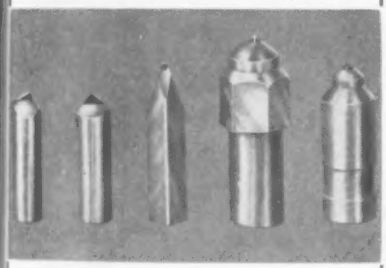

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HANDY ANDY *Says*—

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

LIFE, to me, has been one anticlimax after another, by which I mean that some serio-comic incident has often as not cheated (?) me of the Big Adventure. Back in '06 or so, f'rinstance, I had intended going from Providence to New York, via Sound steamer, when the trolley car I was riding was delayed by a truck, collapsed across the rails.

I got to the dock just as the boat was pulling out, and only the weight of my suitcase, and the ice grinding below, deterred me from leaping aboard. So, I took a night train and, on arrival, found that the liner—the Larchmont—had gone down off Watch Hill with a casualty list of around 200. And so on, I've escaped drowning by seconds, shooting by inches and fire with my shirt tails aflame. But, nothing ever happened.

▲ ▲ ▲

Going to Fort Wayne, March 8th, a driver fell off the locomotive just as we were pulling away from Detroit. If it'd ever happened when we were hightailing along! Anyway, I arrived 2 hrs. late, with the com'tee detailed to meet me in a dither and reg'l director Horace Wentzell holding the fort. Then, in the middle of my talk, I took a chill and rambled on in momentary dread lest my dime store grinders rattle loose. But, as usual, nothing happened. It was all anticlimax.

▲ ▲ ▲

Up 'n' coming, they are, the Ft. Wayners. Secy. Milt Kline met me at the station, along with member Len Roebel—the latter, incidentally, a dead ringer for Detroit's Dave Carlson. Milt sketched a verbal map of the town as we rolled along, so that by the time we got to the Ch. of C'merce I felt like a native.

At the meeting, I was introduced to past ch'man Cy Grindrod (whom I'd taken for a Norwegian a/c his name), newly-elected Paul Weitzman, and an aggressive young Swede named Francis McGuire. Fine, upstanding young fellows who'd wear well on a fishing trip. Also John Joel, 2nd v. ch'man and Doyal White. Ft. Wayne's Hank Morgenthau. Live wires, of whom some are destined to loom into prominence in the engineering world.

The meeting over, an exchange of ideas mellowed by good sherry. Had an interesting discussion with a young fellow named Walt Janaowski, who not only gave me intimate glimpses into Poland's history, but who has a keen insight into technological development as well. Keep going, Walt!

▲ ▲ ▲

To bed at 2 A. M. and up at 6:30, when a 2 mile hike around the town confirmed all the good things Milt Kline had said about the city. B'fast with Horace Wentzell, a digest of local and general news, then for the depot and home. Only, the eastbound train was 2 hrs. late, too. The locomotive must have thrown the other shoe.

Got back in time to attend Detroit Chapter's meeting, dedicated to the Old Timers. Eye rambling around, saw Walter Wagner, Frank Shuler, Joe Siegel, Charley Staples, Clyde Mooney and Al Sargent in close proximity. Daddy O. B. Jones was among the missing, as were Bert Carpenter, Bill Smila and Ot Winter—the latter AWOL at Ft. Wayne, too. (Your coffee got cold, Ot.)

But I saw Fred Hoffman and Ed Beyma in the offing, along with Earl Ruggles, C. S. Horn and E. R. DeLuiz. Ray Farmer was up in front, and I had

(Concluded on page 196)

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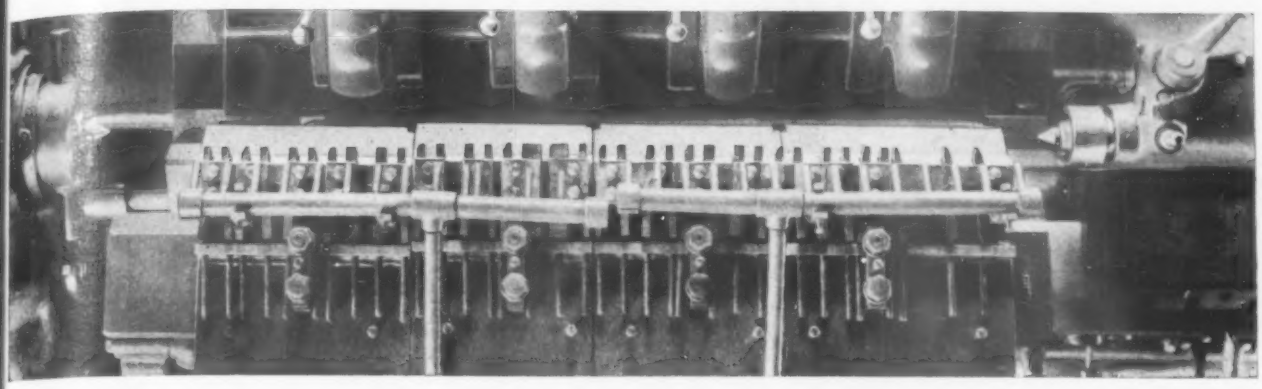
Lo-swing LATHES ON CAMSHAFT WORK



Removing approximately 1/16" of material from the sides of cams and on radius of line bearings of a forged camshaft; slide No. 1 (nearest tailstock) feeds in first; slide No. 2 follows 3/32" late to allow No. 1 slide to start backing out before No. 2 enters the cut on the line bearing. Slides No. 3 and 4 are likewise timed 3/32" late in their movements.

● Lathe work on forged camshafts is usually divided into two or three turning operations: First, the squaring of the sides of the cams, gears and bearings; second, the turning between cams, and third, special machining operations when required.

The above illustration shows the type of tooling used for the squaring of all cams, bearings, gears, etc., in a single operation —thereby assuring the close accuracy required in the spacing of cams on modern aircraft and other types of internal combustion motors.

The squaring tools are usually mounted in 4 cam-controlled slides, each slide timed to feed in a pre-determined sequence. Thus, in the case illustrated above only one set of tools is cutting into the line bearing at any time thereby eliminating any danger of twisting or setting up strain in the shaft. Note the four sturdy roller steady rests for supporting the work and taking the cutting pressure from the tools. These rests are of the hinged type to facilitate loading and unloading.

Illustration at the right shows a Lo-swing Lathe tooled for a secondary operation and equipped with a 2-speed head and automatic control. This arrangement provides the high speeds necessary for finish turning and squaring operations with cemented carbide tools and the low speeds required for an eccentric grooving operation. The lathe automatically shifts from high to low speed and the cam roller on the double eccentric grooving attachment is automatically withdrawn from the cam path during the high speed portion of the cycle.

Another interesting feature of this machine is the 2-slide carriage which accomplishes both roughing and finishing cuts on the small bearing. The roughing tool on the front slide relieves from the work before the tool on the second slide moves in for the finish cut.

Lo-swing engineers are anxious to help you with your camshaft turning problems and will be glad to prepare tool layouts and submit complete data.

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Lo-swing Lathe equipped with a standard two-slide carriage, two back squaring attachments, front steady rest, double eccentric grooving attachment and automatic two-speed head. Operations: cutting a double eccentric oil groove on the head bearing, rough and finish turning and chamfering the small end bearing, and facing and chamfering oil pump drive gear.

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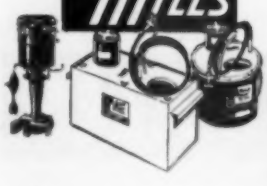

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INDUSTRIAL FLUID REFRIGERATING SYSTEMS

—HANDY ANDY SAYS—

(Concluded from page 194)

a glimpse of Jack Delaney at the rear, along with Roy Bramson, Bill Fors, Clyde Hause, Bill Maier, Ed Lee, Jay Bowen, and Ed Rutt. Oh yes, Lee Diamond was sitting right beside me, and surely, the smiling face over yonder could only have been Ray Brunner's.

At that, I'm not exactly sure as to who constituted the original "33", besides which it's hard to pick out individuals in a crowd. But Slim McClellan (may his shadow never grow less) and popular Nat'l Treas. Floyd Eaton were there, installing the new officers. So was Ade Potter, drumming up business for Philadelphia.

▲ ▲ ▲

While the change was inevitable, I was sorry to see Geo. Whitehouse relinquish the chair. Inclined to disparage himself, he had nevertheless started No. 1 on a marked comeback, and a signed resolution of appreciation, presented him by the incoming ch'man, was well deserved. George set a goal for his successor, Grant Wilcox, Jr., to shoot at.

Grant, however, is young and energetic and has the Society's welfare very much at heart. He has the qualities of leadership and, despite the confusion incidental to the start, has a golden opportunity to cohere No. 1 during his incumbency. We'll just have to get behind him, eh? Anyway, good luck, Grant!

▲ ▲ ▲

From one thing to another, I was invited into the Swedish Engineers Society, (Detroit) a couple o'years back, and before I'd learned to say Skoal in the vernacular they made me secretary. Imagine it, trying to make me work! Well, they know better by now. Anyway, the Society includes a number of A.S.T.E.ers, among them some past directors—John Markstrum, for one—so any of you boys would feel at home. And you're welcome! (We meet the 3rd Friday at the Wardell).

A group of us were at dinner, one eve, when I saw our past prex Jim Weaver at an adjacent table. So, I called him over and introduced him to the boys—or vice versa—whereupon Jim made the remark that maybe there'd be some good mechanics among us—i. e., among the Swedes, now. But, nobody was looking for a yob; instead, we invited Jim as a guest speaker at a later meeting, all very much to our satisfaction. Thanks, Jim!—and this is just by way of keeping you before your public.

▲ ▲ ▲

Well, that's all for now. By the time this gets to the readers, the Philadelphia Convention will be history, although I plan to give you my impressions in the May issue (Maybe something'll happen, eh?).

Anyway, the Bramson Publishing Company is holding the presses, so as to give you pictures and highlights, so we'll probably be mailing a couple of days late. But, it will be the best publication you've ever had, just as every issue has been an improvement over its predecessor. THE END

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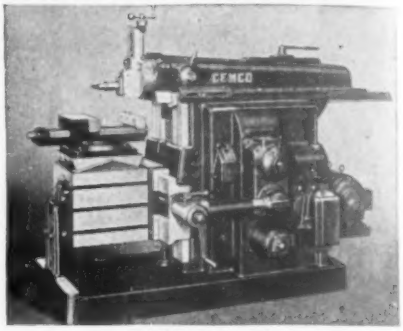

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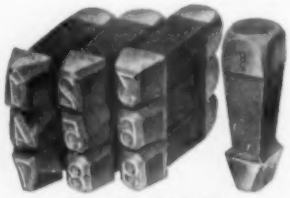

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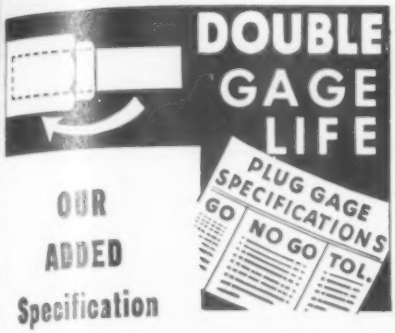

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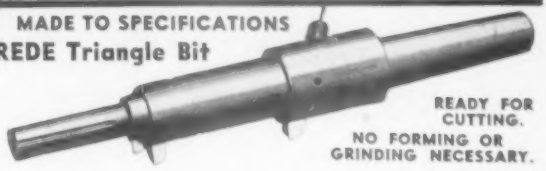

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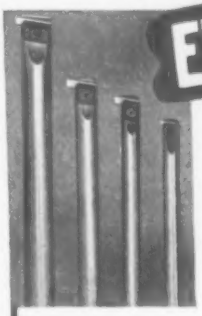

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C-F Positioners come in 6 sizes — capacities to 30,000 lb. All are pedestal mounted, rotates 360° and tilt to 135° beyond horizontal.

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A. S. T. E. DOINGS

● National Headquarters of the American Society of Tool Engineers: 2567 West Grand Boulevard, Detroit 8, Michigan. Telephone, TYler 5-0145. National Officers (term of 1943-1944): President, Ray H. Morris; 1st Vice-President, Douglas D. Burnside; 2nd Vice-President, C. V. Briner; Secretary, Earl V. Johnson; Treasurer, Floyd W. Eaton; Executive Secretary, Adrian L. Potter.

● For application blanks and information pertaining to membership in the American Society of Tool Engineers, address the Secretary's office, 2567 West Grand Boulevard, Detroit 8, Michigan. Senior initiation fee is five dollars. Dues, eight dollars per year for senior grade membership, and five dollars per year for junior grade membership. Junior initiation fee is two dollars.

Atlanta: The March 1 meeting was held at the Henry Grady Hotel. Dinner was followed by a quiz program conducted by a committee composed of Jack Childs and Cliff Brownell, who arranged a set of questions pertaining to tooling and related trades. An open discussion followed the program.

Binghamton: At the technical session of the March 8 meeting, held at the Arlington Hotel, Mr. Squibb, broach engineer from Cincinnati Milling Machine Co., talked on "Broaching." Also on the program was showing of a series of slides on broaches, their capacity and uses, and a movie showing automatic broaching of engine blocks. Ninety-one persons attended the meeting.

Buffalo-Niagara: Officers elected at the Feb. 17 meeting are: Chairman, H. K. Rose; 1st vice-chairman, J. J. Bemb; 2nd vice-chairman, M. W. Kotorba; secretary, W. M. Sossong, and treasurer, Aubrey G. Dayman. C. V. Briner, 2nd vice-president, addressed the meeting, speaking on the Society and its hopes and possibilities. Also on the program was the showing of a sound movie entitled "War Report."

Central Pennsylvania: E. F. Noel was elected chairman for the ensuing year at the Feb. 8 meeting. Other officers elected are: 1st vice-chairman, M. L. Gotwald; 2nd vice-chairman, C. L. Boughter; secretary, C. E. Noel, and treasurer, J. Welsh.

C. V. Briner, 2nd vice-president, addressed the March 14 meeting, substituting for Ray H. Morris, national president, previously scheduled to speak. Adrian L. Potter, executive secretary who also attended the meeting, reports that members drive from as far as 55 miles to attend the sessions, and that plans are under consideration to hold meetings in other cities in Central Pennsylvania occasionally.

Technical speaker was Al W. Ruff, vice-president in charge of engineering, York-Shipley Corp. He spoke on "Development Procedure."

Chicago: More than 200 persons attended the March 6 meeting. In line with the program, designed to discuss several important points of grinding in detail rather than to attempt wide coverage, the following topics were presented: "Fine Finishing of the Cutting Edges of Tools," by V. H. Ericson of the Norton Company; "Problems of Production Grinding" by B. H. Work of the Carborundum Co., and "Grinding Lubricants" by W. H. Oldacre of D. A. Stuart Oil Co.

Left: Walter E. Trask, charter member of Boston chapter, who was recently promoted to superintendent of General Electric's supercharger plant at Everett, Mass.
Right: Howard E. Burnett, also a Boston chapter member, and planning engineer at the supercharger plant.

Officers elected at the meeting are: chairman, J. R. Miller; 1st vice-chairman, F. A. Armstrong; 2nd vice-chairman, Harry R. Nelson; secretary, F. J. Schmitt; and treasurer, H. M. Taylor. The first annual dance will be held May 6 at the Furniture Club of America.

Cincinnati: H. W. Huffman, field engineer for The Cincinnati Milling Machine Co., was technical speaker at the March 14 meeting held at the Alms Hotel. He spoke on "Tool Cutting Design and Methods of Grinding."

Columbus: Werner J. Blanchard, general manager, Aeroproducts Division of General Motors Corp., was technical speaker at the March 14 meeting held at the Hotel Fort Hayes.

Mr. Blanchard gave a short talk on the aviation industry in general. He also showed a short film on aviation and explained the mechanics of aircraft propellers. He also presented a film showing how the propellers are manufactured and what makes them automatically change pitch in relation to the rpm of the motor. It was announced that the April meeting will be set back one week to April 18 to accommodate the scheduled speaker.

Dayton: Nearly 100 persons attended the Fun Nite Dinner held at Miami Hotel March 13. Ora Peters gave a report on the coming 1944-45 yearbook and Adam Lensch reviewed the Chapter's growth for the past two years and asked support to hit a membership goal of 450 before the incoming officers are installed. Earl D. Johnson, national secretary, discussed the Philadelphia convention and urged members to attend.

Decatur: E. V. Flanders, superintendent of the Thread Grinding Department of Jones & Lamson Machine Co., spoke on "Modern Methods of Thread Grinding" at the Feb. 2 meeting held at the Decatur Club Ballroom.

Officers elected for the coming year

(Continued on page 202)

This photo snapped at the Fairfield County Chapter Installation Night March 1, shows (left to right): A. S. Curry, chairman; C. B. Christensen, first vice-chairman, Charles Gluck, second vice-chairman; Francis Bulmer, secretary; Oscar W. Cooper, past chairman; S. R. Duguay, assistant secretary; Thomas J. Keating, treasurer; Ray H. Morris, national president, and Fred W. Dawless, regional director who conducted the installation.

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are: Chairman, Otto E. Gunthner; 1st vice-chairman, Edward C. Warsaw; 2nd vice-chairman Gustaf A. Johnson; secretary, Victor R. Farlow, and treasurer, George L. Miller.

Detroit: Past national presidents, Detroit chapter chairmen, and the original board of directors were guests at the "Old Timers" meeting held at the Detroit-Leland Hotel March 9.

Floyd Eaton, national treasurer, conducted installation of new officers. The new chairman presented a scroll of appreciation to retiring chairman George Whitehouse.

The technical subject, "Statistical Quality Control," was discussed by Dr. Edwin G. Olds of Carnegie Institute of Technology and Louis C. Young of Westinghouse Electric & Mfg. Co. Also on the program was a talk on "Dimensional Control" by Ralph Lilleberg of The Sheffield Corp. His talk was illustrated by slides of various devices recently designed for multiple checking of parts in a single operation.

Elmira: Technical speakers at the March 6 meeting were James H. Duncan and James A. Malcoln Jr. of R. C. A.

Mr. Duncan spoke on "Industrial Economics," backing up his statements with data from actual reports. Mr. Malcoln talked on "Motion Economy," explaining its purpose and benefits. Problems were flashed on the screen and members were asked to make suggestions to correct the setup for production. Later, methods used by R. C. A. were displayed as a check against suggestions submitted.

Fairfield County: Officers elected at the installation night meeting, March 1, are: Chairman, A. S. Curry; 1st vice-chairman, C. B. Christensen; 2nd vice-chairman, Charles Gluck; secretary, Francis Bulmer, and treasurer, Thomas J. Keating. Installation was conducted by Fred Dawless, regional director.

Also on the program were a talk by Ray H. Morris, national president, and sound pictures shown by A. B. Collins, representing the Federal Products Corp. Between 80 and 90 persons attended the technical session.

Fond Du Lac: Technical speaker at the March 10 meeting was V. E. Johnson, engineer for Westinghouse Electric and Mfg. Co., who presented an address on "Electronics at Work." He illustrated his subject with a film showing the operation of various types of electronic tubes. Also on the program was presentation of moving pictures on Tarawa and Mexico by E. L. Zimmerman of the Illinois Tool Works.

Fort Wayne: A. E. "Handy Andy" Rylander, technical editor of The Tool Engineer, was principal speaker at the March 8 meeting held at the Chamber of Commerce. More than 100 members and guests were present.

Horace Wentzell, regional director, installed newly-elected officers. Otto W. Winter, past national president, was unable to attend the meeting. Speaker at the April meeting will be George Sanborn of the Fellows Gear Shaper Co., who will speak on "Gears At War".

Golden Gate: Officers elected at the Feb. 6 meeting are: Chairman, Harold Wolpman; 1st vice-chairman, Harold Burlingame; 2nd vice-chairman, Fred C. Martens; secretary, Karl L. Bues, and treasurer, Henry H. Hagedorn. Technical speaker was George H. Sanborn, chief field engineer from the Fellows Gear Shaper Co. Approximately 120 members and guests attended the meeting.

Greater New York: W. C. Rhodes, Jr., was elected chairman for the ensuing year at the Feb. 7 meeting.

Other officers elected are: 1st vice-chairman, J. D. Schiller; 2nd vice-chairman, H. Horton; treasurer, J. Brady and secretary, H. W. Fink. More than 200 members and guests were present.

At the technical session of the March 6 meeting, held at the Hotel New Yorker, C. O. Herb, managing editor of "Machinery," was principal speaker. He talked on "Negative Rake Milling."

Hamilton: Approximately 125 members attended the March 10 meeting, held at the Royal Connaught Hotel.

(Continued on page 204)

Lead screw of automatic feed mechanism, fabricated from B&L Cold Finished Shafting.

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It is a means of reducing vibration under high speed rotation. For special shafts and cut-from-the-bar parts, such as lead screws . . . where machined dimensions, conditions of concentricity and bar straightness must be held to very close dimensions . . . the general recommendation would be a free-machining type of steel, Cold Finished, Strain Tempered and Special Ground. B&L engineers will be glad to make a specific recommendation for any definite application you may have, including local hardening methods for bearing areas.

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The principal speaker was W. J. Conley, consulting engineer for The Lincoln Electric Co. He spoke on "Welding and Welded Jigs and Fixtures." His talk was illustrated with lantern slides.

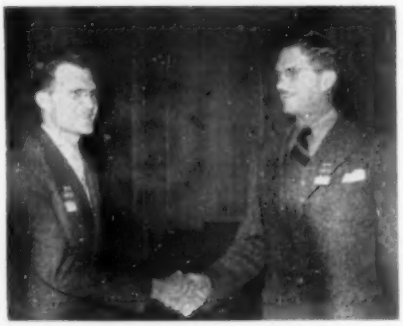
Hartford: E. W. Daugherty of Whitman & Barnes, was technical speaker at the March 6 meeting. He spoke on drilling and reaming.

Ray H. Morris, national president, installed the following new officers: Chairman, Henry A. Rockwell; 1st vice-chairman, George A. Highberg; 2nd vice-chairman, Edmond Morancey; secretary, Joseph Balciunas, and treasurer, A. B. Lindstrom.

Houston: Approximately 115 members and visitors turned out for the Feb. 15 meeting to hear George H. Sanborn, chief field engineer, Fellows Gear Shaper Co., talk on "Gears At War."

The following new officers were installed: Chairman, Louis Krausse; 1st vice-chairman H. R. Turner; 2nd vice-chairman, John C. Preston; secretary, Homer Briggs, and treasurer, L. P. Robinson.

Indianapolis: Technical speaker at the March 2 meeting was H. S. Linsley of the Wright Aeronautical Corp. He gave a talk on transition from "custom built" aircraft engines to those manufactured in quantity production. The talk was followed by slides and a motion picture.



Chris Vogt (left), outgoing chairman of the Houston Chapter, congratulates Louis Krausse, newly-elected chairman.

The following new officers were inducted: Chairman, Joseph N. Huser; 1st vice-chairman, Harry Boese; 2nd vice-chairman, Chester Willoughby; secretary, Harry Featheringill, and treasurer, Paul Cave.

Kansas City: The regular monthly meeting was held at Fred Harvey's Pine Room, Union Station, March 1.

The guest speaker was P. L. Wilson, representative of the Sparton Aircraft Corp., who talked on "The Story of Lithium." 1944 officers were installed by W. W. Mason, chairman.

Little Rhody: The principal speaker of the Feb. 28 meeting was G. E. Brumbach, representing The Carpenter Steel Co., who spoke on "Tool Steels."

Officers for the coming year also were elected at the meeting are:

Chairman, Lloyd Sheeran, 1st vice-chairman, Ralph Cassady; 2nd vice-chairman, Elliot Parker; secretary, John H. Williams, and treasurer, Al Rogers.

Principal speaker at the March 27 meeting was James P. Gill, vice-president and chief metallurgist, Vanadium Alloys Steel Co. Mr. Gill also is co-author of the book "Tool Steels." An open forum was held after the lecture.

Milwaukee: Fred W. Whitcomb, field engineer of Motor Products Corp., Deepfreeze Division, spoke on "Low Temperature Refrigeration in Industry" at the March 9 meeting held at the Astor Hotel.

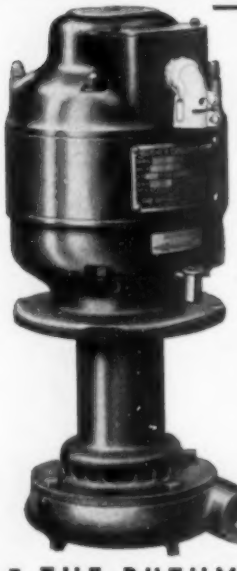
He discussed the value of low temperature refrigeration on many common tools used in industry and for overcoming strain and stress of metals subjected to heat and temperature changes over short periods of time.

Montreal: W. T. Muirhead, vice-president and general manager of A. C. Wickman, Ltd., spoke on "Tools of Today for The Jobs of Tomorrow" at the March 8 meeting held at the Windsor Hotel.

Also on the program was a talk by F. T. Ellis, special sales engineer of The Heald Machine Co. who spoke on "Precision Borizing—Precision Finishing of Surfaces." The talk covered methods of securing fine finish and ac-

(Continued on page 206)

FEWER PARTS
LESS WEAR



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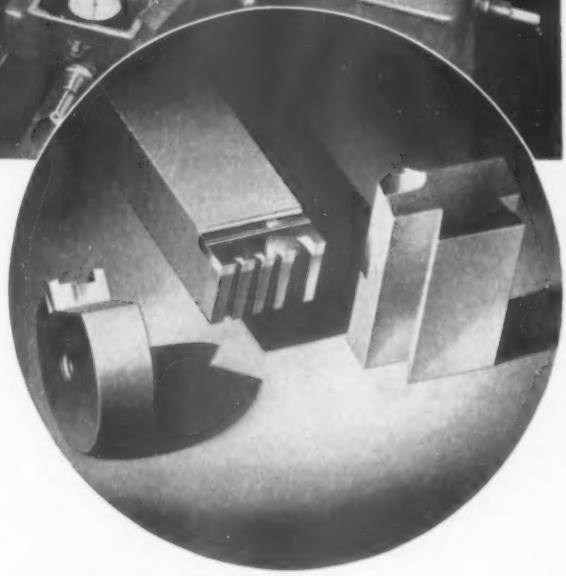
50 TO 1 PANTOGRAPH
30 POWER MICROSCOPE
CROSS HAIRS OF MICROSCOPE FOCUS ON WORK AND GRINDING WHEEL. INTERSECTION OF CROSS HAIRS CORRESPOND TO THE POSITION OF THE POINTER ON 50 TIMES SIZE LAYOUT.

Make Possible The ACCURATE GRINDING Of Profiles Such As These In Tungsten-Carbide Or Other Hard Metals



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● Accuracy is held to within ± .0005". This accuracy is not affected by wheel wear and no special shapes or radius dresser need be used.

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curacy on boring, turning and finishing operations. Mr. Muirhead's talk was illustrated with a film and Mr. Ellis's address was accompanied by slides.

New Haven: Technical speaker at the March 9 meeting held at the Duncan Hotel, was C. H. Witlock, technical engineer of the Plastic Division, Monsanto Chemical Co. He presented an interesting talk concerning the history of plastics and the present status of mold designs. He illustrated his talk with numerous sample molds. There were 100 members and guests present at the meeting.

Northern New Jersey: Technical speaker at the March 14 meeting held at Hotel Robert Treat, Newark, was Kirke W. Connor, president Micromatic Hone Corporation. Mr. Connor talked on "Honing Goes To War."

New officers elected at the February meeting are: Chairman, Edward Murphy; 1st vice-chairman, John Webster; 2nd vice-chairman, Frank L. Delhagen; treasurer, Grover Masters, and secretary, H. Wilson Ryno.

North Texas: H. M. Huffman, engineer for Cincinnati Milling & Grinding Machines, Inc., was principal speaker at the March 3 meeting held at Oak Lawn Village Restaurant in Dallas. The subject was "Cutter Sharpening Practice."

Peoria: George H. Sanborn, field engineer for Fellows Gear Shaper Co., was principal speaker at the March 7 meeting held at the Hotel Jefferson. He talked on "Gears At War."

Also on the program was an address by L. J. Fletcher, director of training for Caterpillar Tractor Co. He is well known for his advanced ideas and system of industrial training.

Officers elected to head the new Portland (Ore.) chapter are (left to right): Elton H. Strahorn, secretary; Raymond. E. Neils, 1st vice-chairman, Eugene Butzer, chairman, John R. Barrett, treasurer, Robert L. Smith, 2nd vice-chairman.

Pittsburgh: Bent Laune, chief engineer for Eutectic Welding Co., spoke on "Tool Salvage" at the March 3 meeting held at the Fort Pitt Hotel. His talk was illustrated with slides showing examples of tools that had been repaired by brazing methods.

At the conclusion of Mr. Lanue's talk, the recently elected new chapter officers were installed.

Portland (Oregon): Installation of this new chapter was conducted by Ray H. Morris, national president, at the Charter Night meeting held Feb. 23 at the Bohemian Restaurant. Attendance was 36 members and 40 guests.

Following an address by Mayor Earl Riley dealing with problems of tool engineers and machinists in England, President Morris conducted the election and installation of officers.

(Continued on page 208)

Thomas Barker, tool room foreman for the Bangor and Aroostook Railroad, was killed instantly Feb. 19 when a locomotive driving rod let go. He had been elected 2nd vice-chairman of the Portland (Me.) chapter at a meeting the night before.

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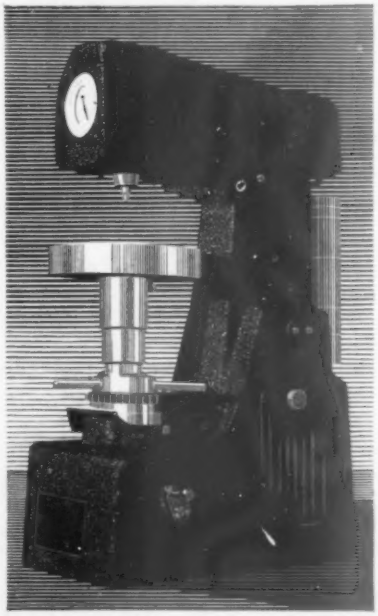

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MODERNIZE *with*

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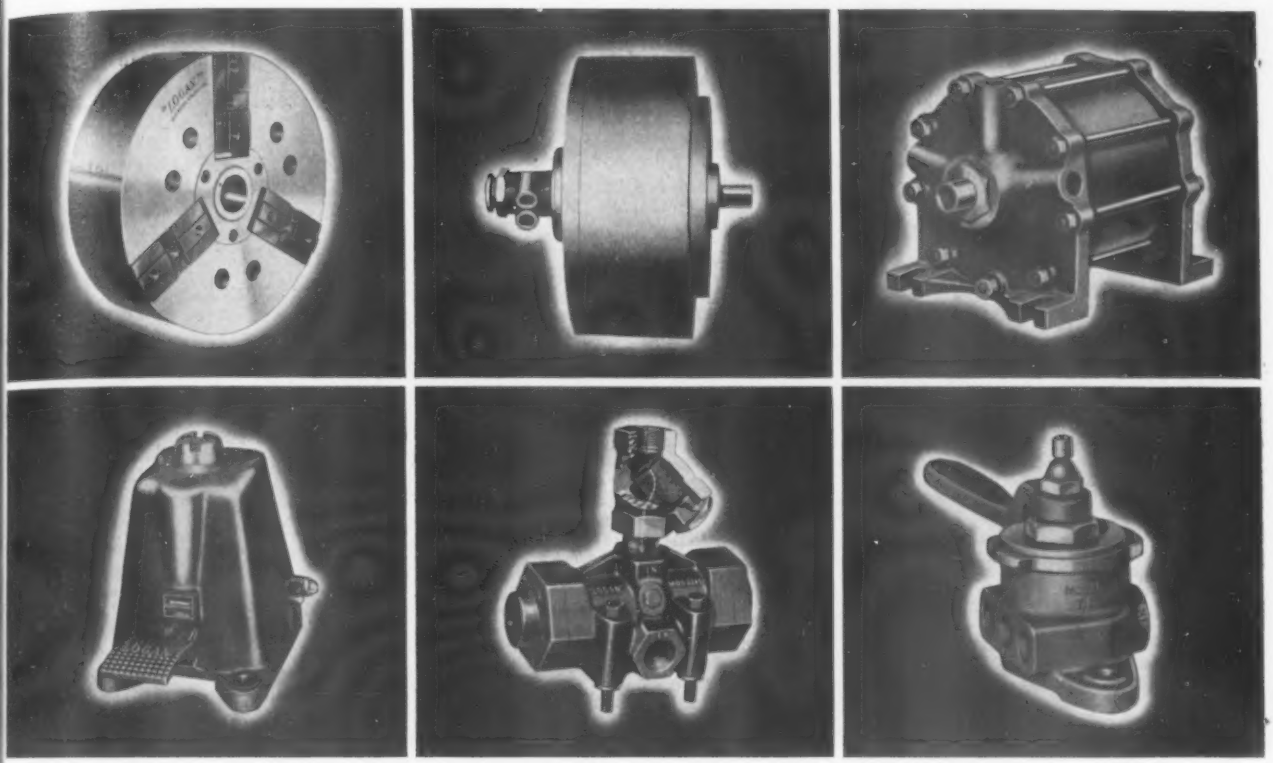
AIR *and* **HYDRAULIC EQUIPMENT**



THE POSTWAR period will bring to manufacturers many changes that will be difficult to face. When the stress changes from production at any cost to production at lowest cost, competition will be keen and demands will be for the highest possible quality at the lowest possible cost. At the same time, labor will be exerting every effort to maintain the highest hourly wage rates. The only way these demands can be met is by higher machine production rates. Manufacturers must have machines that will produce more and better products with fewer man hours and machine hours per unit. *"LOGAN"* Air and Hydraulic Equipment is designed to save these man and machine hours. Easily adaptable to all types of production machines, thousands of uses have been found for *"LOGAN"* Equipment in the leading industrial plants of the world. Although *"LOGAN"* Engineers are engaged on war problems, their experience in planning for the "peacework" future is available and will eliminate many bottle-necks later. Let *"LOGAN"* Engineers make recommendations on modernizing the equipment in your plant by the application of *"LOGAN"* Air and Hydraulic Equipment.

"LOGAN" SAVES TIME EFFORT MOTION

LOGANSPORT MACHINE CO., INC.

902 PAYSON ROAD. . . . LOGANSPORT, INDIANA

MANUFACTURERS OF AIR AND HYDRAULIC DEVICES, CHUCKS, CYLINDERS, VALVES, PRESSES, PUMPS AND ACCESSORIES.

The following officers were inducted: Chairman, Eugene Butzer; 1st vice-chairman, Raymond E. Neils; 2nd vice-chairman, Robert L. Smith; treasurer, John R. Barrett, and secretary, Elton H. Strahorn.

Portland—(Maine): D. W. Rockwell, of the Lindberg Engineering Co., gave a short talk on "Heat Treating Equipment for a Tool Room" at the Jan. 18 meeting held at the Lafayette Hotel. He also presented a motion picture entitled "Heat Treating Hints".

Roy Fairfield was coffee speaker. He spoke on problems involved in the termination of war contracts. Twenty-six members and nine guests attended.

Potomac: The Second Annual Ladies Night was held at the Mayflower Hotel, March 2, with 190 persons present for the dinner and 225 at the technical session.

Featured speaker at the technical session was Ernest M. Seifert, who talked on "History and Development of Modern Torpedoes." Although approved and cleared by the Navy Department for delivery to a select group, the address could not be printed.

Also on the program was the showing of the picture entitled "High Speed Camera" shown through the courtesy of the Massachusetts Institute of Technology.

Racine: Robert Jones has been named chairman of the chapter to succeed William Davidson. Other officers elected are: 1st vice-chairman, R. M. Goodsell; 2nd vice-chairman, Al Nelson; secretary, Stan Welling, and treasurer, Joseph Holzman.

John M. Birdsong, spoke on "Steel Making from Ore to the Finished Steel Bar."

Rochester: J. B. Wilkie, gage engineer of the Pratt & Whitney Division of Niles-Bement-Pond Co. was technical speaker at the Feb. 15 meeting. He talked on "Production Gaging." His talk was illustrated with slides.

Officers elected at the meeting are: Chairman, Chauncy C. Newton; 1st vice-chairman, Earl DeBisschop; 2nd vice-chairman, Charles Seeley; 3rd vice-chairman, Milton L. Roessel; secretary, Donald Kohler, and treasurer, Fred Bittner. Emmet Moore, Joseph Petz, and Ernest Straw were elected directors.

Rockford: The March 9 meeting was held at the Faust Hotel with 150 present. New officers elected are: Chairman, Fred Swanson; 1st vice-chairman, Walter Lustig; 2nd vice-chairman, Donal Hawkinson; 3rd vice-chairman, Ernest Seborg; secretary, Ernst Norrman and treasurer, Joe Jannenga.

Lieutenant Davis of the Royal Navy talked on his experiences at Dunkirk. Also on the program was showing of two films, entitled "War Communique" and "Muskie Fishing."

San Diego: The following new officers were installed at the March 10 meeting: Chairman, John E. Birdsall; 1st vice-chairman, George Lawson; 2nd vice-chairman, Ray Bubel; 3rd vice-chairman, Gerald Bradbury; secretary, William Robinson, and treasurer, J. E. Birney.

Louis Lingler, sponsored by The Sheffield Corp. and the Moore Machinery Co., was technical speaker. He talked on "Dimensional Control." Also on the program was an address by Don Dreher, president of Adhere Corp. He talked on "Toolite." The talk covered thermo setting plastic as used for tools, drill jigs, drop hammer dies, and similar purposes.

Schnectady: L. S. Martz, assistant to the president of Micromatic Hone Corp., spoke on "Precision Honing" at the March 9 meeting at Watervliet Arsenal. He traced the development of honing and described numerous operations being performed in various war plants throughout the country. A discussion followed the address.

The following officers for the 1944-45 season were installed by regional director H. D. Mozeen: Chairman, C. J. Sertl; 1st vice-chairman, E. H. Girardot; 2nd vice-chairman, D. M. Schiele; 3rd vice-chairman, B. L. Hayner; secretary, N. Y. Coxs; treasurer, R. H. Wilke. Attendance was 75 persons.

South Bend: P. D. LaHue, representing Westinghouse Electric and Mfg. Co., spoke on "Electronics At Work" at the March 14 meeting held at the

(Continued on page 210)

34 BLOCK ULTRA-CHEX
MAKES 80,000 COMBINATIONS

The ULTRA-CHEX set shown above consists of 34 gage blocks which will make up about 80,000 combinations in steps of 1/10000" from .300" up to 8". These blocks are absolutely essential in precision and interchangeable manufacture. They make it possible for mechanics and toolmakers to produce work to specified limits of accuracy, to repeat precision work with assurance of interchangeability and to set and check measuring instruments to exact dimensions.

BEWARE OF WORN GAGE BLOCKS.
If your present set of gage blocks has been in use for sometime, the chances are it will have worn and may be undersize. Don't take chances on rejections. Order a new 34 block Inspectoset, check your used set, and you can easily compensate for any divergence from size.
ORDER YOUR SET TODAY. Price $125.00 including optical flat.

COMPARITOL for checking gages and work to 1/10000". $195.00

WILDER PROJECTOR for comparing by means of shadow image. $268.75

MAGNI-RAY illuminated magnifier for inspection. $18.50 $27.50

GEORGE SCHERR CO., INC.
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UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

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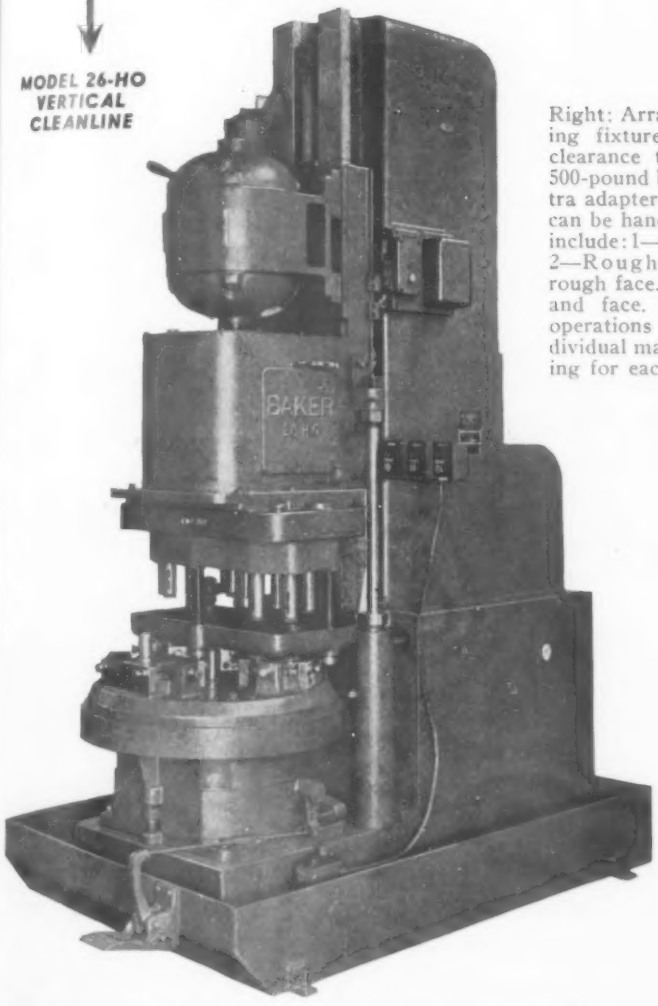
Hydraulic Feed Machines

MODEL 26-HO VERTICAL CLEANLINE

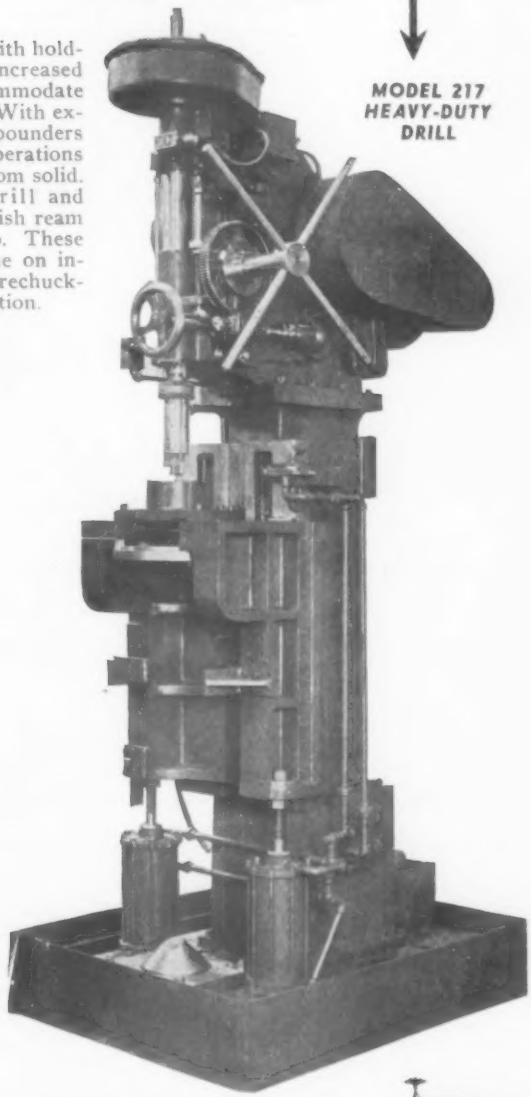


●This versatile Baker machine is illustrated as set up for operations on guides used on tanks. Drilling operations are handled at the left cutting station, reaming operations at the right cutting station. Two parts are secured at each cycle. ●This machine has a special 8-spindle fixed center head and a 3-station hand index table. The spindles are all mounted on ball bearings, with vertical adjustment sleeves in each spindle end for seating of tools. ●A wide range of speeds is available—all controls are convenient to the operator. Readily changed over for work on many other types of parts. Special fixtures and special multiple head are furnished by Baker Brothers, Inc.

Mechanical Geared Feed Machines

Right: Arranged with holding fixture and increased clearance to accommodate 500-pound bombs. With extra adapters, 1000-pounders can be handled. Operations include: 1—Drill from solid. 2—Rough coredrill and rough face. 3—Finish ream and face. 4—Tap. These operations are done on individual machines, rechucking for each operation.

MODEL 217 HEAVY-DUTY DRILL



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ARMY E NAVY

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DOES 4 JOBS *faster than one!*

This special carbide tip cutter is made for Pratt & Whitney Aircraft Division by Eclipse. Bores four diameters, finishes three faces simultaneously, at high speeds.

★ You know your job better than anyone else—by the same token thirty years' background qualifies us to offer expert engineering advice on end cutting tool problems.

★ Why not add this experience to your engineering facilities—cut your machining costs, as others are doing, by availing yourself of the very latest thinking in tool design.

★ Eclipse can help you do your job faster—better—cheaper.

Do you have our catalog number 43?

ECLIPSE COUNTERBORE CO.
Founded thirty years ago
DETROIT AND FERNDALE, MICHIGAN

—A. S. T. E. DOINGS—

Indiana Club. New officers for 1944-45 were installed at the meeting.

Springfield, (Ill.): Chapter 64 was chartered here March 18 with 56 members at a meeting in the Leland Hotel. D. D. Burnside, 1st vice-president officiated in presenting the charter and installing new officers.

Those installed are: Chairman, John V. Jovorsky; 1st vice-chairman, Henry G. Becker; 2nd vice-chairman, Harry H. Washbond; secretary, Harvey J. Sheffler, and treasurer, Lawrence T. Kraus.

Toastmaster at the meeting was Frank Martindell, past chairman of the Chicago chapter. John W. Kapp, mayor of Springfield, gave an address of welcome. Principal address was given by D. D. Burnside. He outlined the history, functions, obligations, and opportunities of the Society.

Following the meeting, an officers' school was conducted by Burnside, Ray Hoefer, Martindell, Ben Brosheer of Chicago, and Fred Kane, Peoria.

Springfield-(Mass.): Officers elected for the ensuing year at the Feb. 14 meeting, held in the Highland Hotel are: Chairman, Kenneth Abbe; 1st vice-chairman, Edward Stone; 2nd vice-chairman, Charles Stonerod; secretary, Alexander Todd, and treasurer, Wendell T. Ingham.

Technical speaker was John C. Howell, economist and lecturer, who spoke on business after the war and how it will affect tool engineers.

St. Louis: A record crowd turned out March 2 for installation of new officers by Douglas Burnside, 1st national vice-president, at the York Hotel.

Principal speaker was Dr. Hilton I. Jones, chemical research consultant and managing director of "Hizone" Laboratories, who spoke on "A Chemist Views The Future." He discussed recent scientific developments in chemical engineering.

New chapter officers are: Chairman, Ralph Mueller; 1st vice-chairman, Wm. Scheer; 2nd vice-chairman, Jacob Demuth; secretary, Harold Buchanan, and treasurer, Cal Stephens.

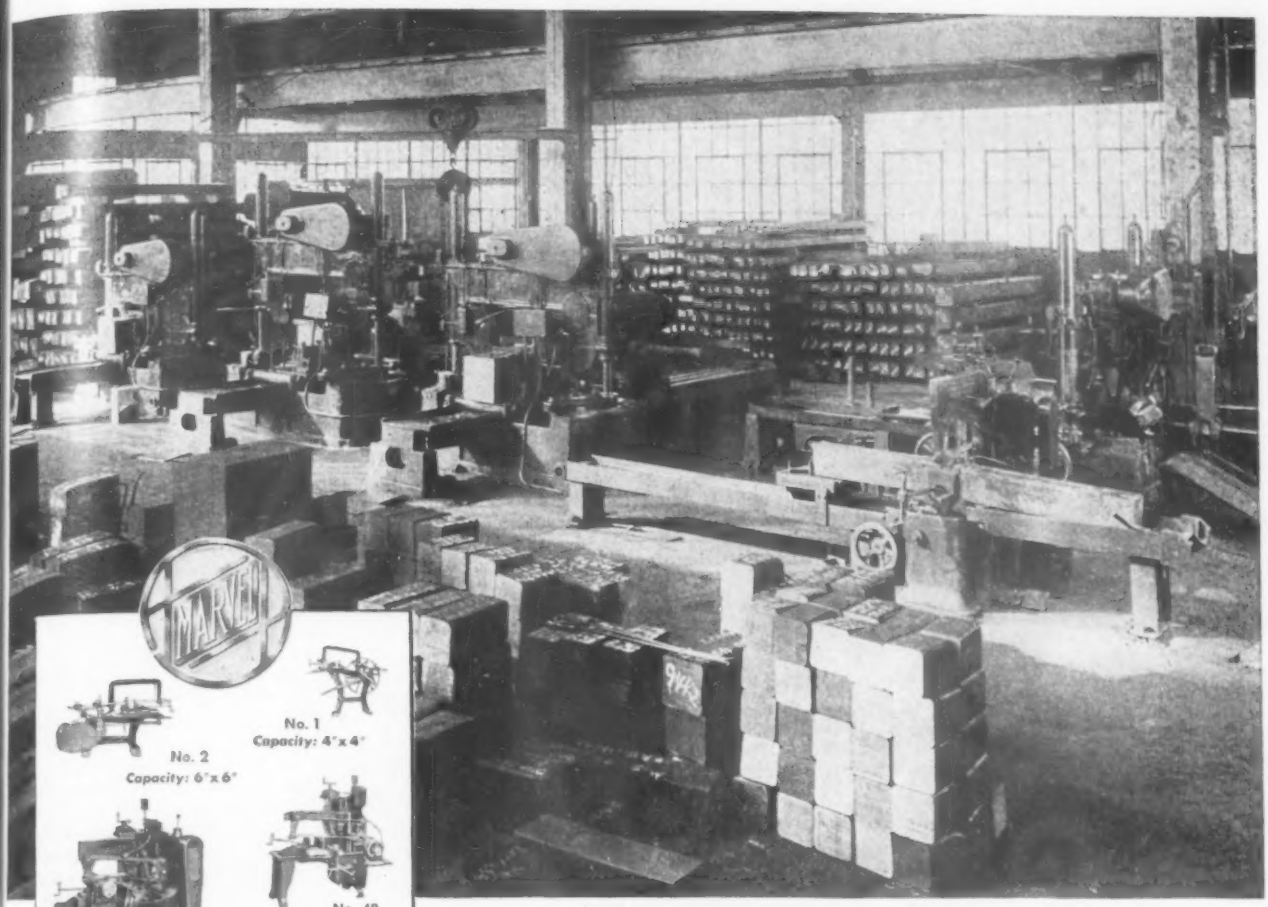
Toledo: H. A. Linsley, technical director of public relations, Wright Aeronautical Corp., addressed the March 8 meeting at the Toledo Yacht Club.

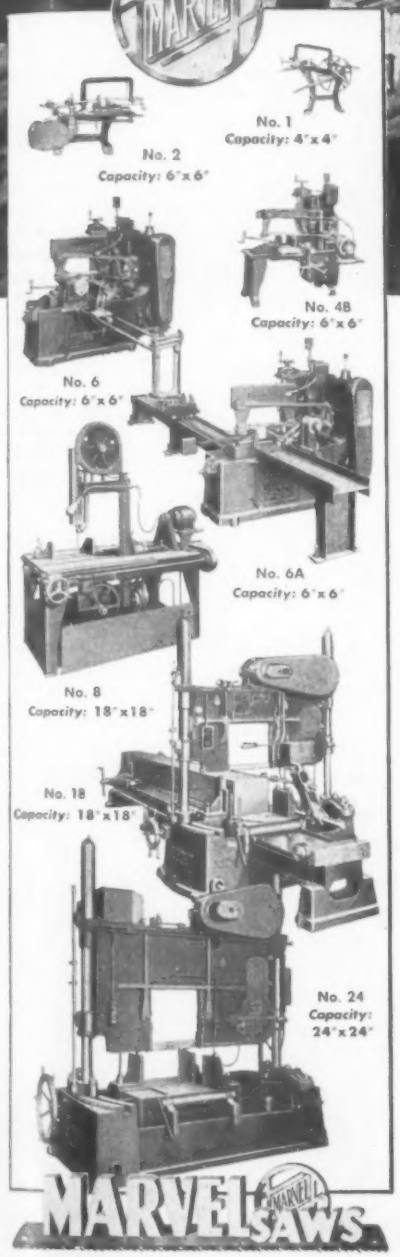
Mr. Linsley, who is also chairman of the Northern New Jersey chapter, discussed "Aircraft Engines on the Production Line." Also on the program was showing of a moving picture entitled "Power by Wright."

Tri-Cities: New chapter officers are: Chairman, T. L. Ramsay; 1st vice-chairman, A. L. Geiger; 2nd vice-chairman, L. J. Rodgers; secretary, L. Dahlen, and treasurer, B. Peterson.

At the March 6 meeting held at the LeClaire Hotel, Moline, Wm. Black, Chicago Molded Products Corp., spoke on "Plastics." Also on the program was a coffee talk, "Flight Training," by John M. Lawless, a commercial flight instructor at the Army Indoctrination School at Moline Airport.

(Continued on page 212)





2 MEN NOW DO THE WORK OF 4 AND SAVE FORGING STEEL TOO

The Ajax Steel & Forge Company, Detroit, has solved its cutting-off problems with a battery of MARVEL Saws. Before, billets were cut-off with a hammer—an operation which not only required at least four men and tied up hammers and furnaces, but also resulted in the waste of a great deal of forging steel.

Now two operators with seven MARVEL Saws supply the entire plant with billets cut to exact size from bars up to 18"x18" square. In addition to their present MARVEL Saws, five of which are illustrated above, this company is adding a super-giant MARVEL No. 24 Hydraulic Hack Saw—the new mammoth saw that quickly cuts-off the toughest steels in sizes up to 24" x 26" cross section.

Our local MARVEL Sawing Engineer will gladly call at your plant, study your metal cutting problems and make recommendations as to methods and equipment. Write for new Catalog.

BUY FROM YOUR LOCAL DISTRIBUTOR

ARMSTRONG-BLUM MFG. COMPANY

"The Hack Saw People"

5700 Bloomingdale Avenue **Chicago 39, U. S. A.**

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Model 340

LAMBERT MODEL 340 SUPERFINISHER

The Model 340 is a production machine for small parts. Any lathe tool, milling cutter, reamer, or any other tool that can be ground on a tool and cutter grinder, can be SUPERFINISHED on this machine.

LAMBERT MODEL 325 SUPERFINISHER

LAMBERT SUPERFINISHERS are built in three sizes. The Model 325 has a swing over the bed of 14" and 11¼" over the carriage with 48" or 62" between centers. It is a completely universal machine for external and internal rounds, tapers, and flats.

NOW YOUR LATHE CAN BE USED FOR SUPERFINISHING

A lathe attachment, complete with variable speed, a complete lubricant system including tank, pump and filtration system is now available. Either internal or external SUPERFINISHING heads can be furnished.

Model 325

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OHIO UNITS--Licensed Manufacturers

DAYTON 4, OHIO

—A. S. T. E. DOINGS—

Twin Cities: The March 15th meeting was held at the Covered Wagon at Minneapolis. A representative of the Federal Products Co. spoke on "Gaging Problems." His address was illustrated with a moving picture.

Twin States: Principal speaker at the March 8 meeting held at Springfield, Vermont, was Sigmund A. Czarnecki of Hamilton Standard Propeller Division of United Aircraft Corporation.

In his talk "Streamline Methods & Equipment for Production," Mr. Czarnecki discussed the importance of furnishing manufacturers with complete operation sequence details in order to facilitate making accurate quotations and correct tooling set-ups. New officers were installed at the meeting.

Williamsport: Substituting for Ray H. Morris, national president, C. V. Briner, national 2nd vice-president, addressed the Executive Night meeting held at the Odd Fellows Temple March 13. In his talk, "The Tool Engineer's Place in War and Peace," he brought out that the outstanding soldier of production is the tool engineer.

Adrian L. Potter, executive secretary, traced the development of the Society from its origin to its present membership of 16,000, and gave a financial report of the national office.

The following new officers were installed: Chairman, Charles R. Winter; 1st vice-chairman, Jesse L. Strasburg; 2nd vice-chairman, E. W. Vars; secretary, William McCoy, and treasurer, Harold Shaffer.

Mr. Griffith and Mr. Straub of the Carborundum Co. showed an informative film on "First Principles of Grinding." The picture stressed the necessary principles in grinding all the way from the mine to the finished part in the machine shop.

Worcester: Technical speaker at the March 11 meeting was Axel Lundbye, of Crowell-Collier Publishing Co. He spoke on "Chrome Plating of Tools." Also on the program was the showing of a color and sound film entitled "Along The Great Silk Route," loaned by General Motors Corp.

* * *

April Meetings

★

Chicago: May 6. Ladies' Night.

Columbus: April 18.

Fond du Lac: April meeting to be held at Appleton, Wis. Speaker on "Hydraulics" from Vickers, Inc.

Indianapolis: April 6, Claypool Hotel. Dr. Hilton I. Jones will talk on "Peeps at Things to Come."

New Haven: April 13. Duncan Hotel. D. West, LaPointe Machine Tool Co., will talk on "Latest Trends in Broaching."

Potomac: April 19, Spring Dance. Mayflower Hotel.

Will CUTBACKS AND CANCELLATIONS *find you in a favorable tool position?*

Yes! ... IF YOU USE TECO *Cemented Carbide!*

"Watch your inventory!" is the order of the day as plants prepare to meet changes in production. To keep your cutting-tool inventories at lower levels and production at higher levels, use longer-wearing TECO Cemented Carbide for turning, boring and facing operations.

TECO Cemented Carbide has surpassing resistance to wear and breakage. It holds cutting edges longer, yields considerably more pieces per grind and much greater production per tool. Therefore, you make fewer replacements on the machine—need fewer reserves in the toolroom.

Prove these facts in your own shop. Replace present tools with TECO Cemented Carbide on any job—then compare output. Prompt delivery can be made on tools and blanks, in grades, styles and sizes for most machining needs. Outline your requirements. Write for catalog and new price list.

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TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CEMENTED CARBIDE**

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SPEEDY AIR VISE

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• Speedy Air Vise helps workers get out more and better work—in less time! Foot control valve opens and shuts vise instantly, leaving *both* hands free to produce. Operates from air line or individual compressor, exerting a grip of 15 times air line pressure. Jaw opens up to 3 inches, easily fitted to hold castings, parts, jigs. etc. Speeds up every drilling, light milling, tapping and assembly operation. Compact, sturdy, trouble-free, low in cost! ••••• *Speedy Air Vise, complete with Foot Control Valve, Air Hose and Fittings, only* $24

Prompt Delivery from Your Supplier or Write Direct.

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AIR REGULATORS • AIR FILTERS • AIR GUNS • PORTABLE COMPRESSORS

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Load capacity 200 to 40,000 lbs. at 100 rpm

Have adjustment to take up wear and preload bearings

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Standard Morse Taper No. 2 to 6 in stock

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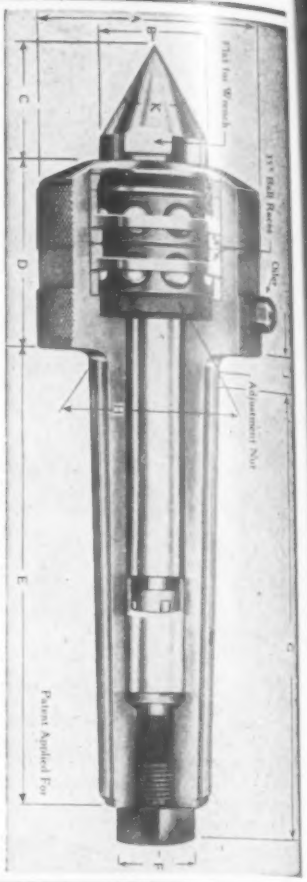

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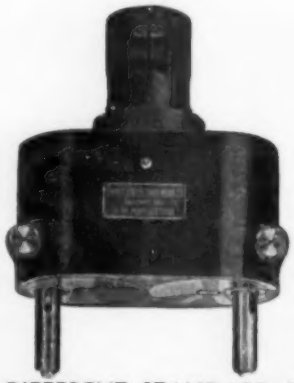
U S HEADS STANDARD SINCE 1915



30 DIFFERENT STANDARD SIZE ADJUSTABLE DRILL HEADS, CAPACITIES UP TO 1½" DRILLS

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All Types of Fixed Center Heads

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"SUPER-SPEED" Pneumatic GRINDER

The only hand grinder with spindle speed of 100,000 R.P.M. on 100 pounds air pressure. It has revolutionized hand grinder performance. Can be directed in any working position; operates with extreme ease. Steel construction throughout. Formed to fit the hand. Weighs only 14 ounces.

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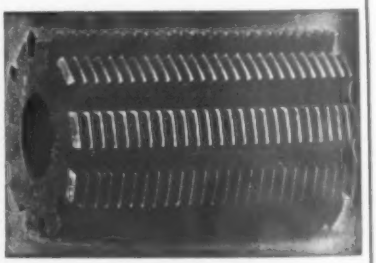
CLASS 1, 2 or 3 FIT, COMBINATION FORM CUTTERS & INVOLUTE SPUR GEAR CUTTERS, 14 1/2° AND 20° P.A.



GROUND PRECISION THREAD CHASERS FOR THREADING MACHINES

Send Blueprints and Specifications

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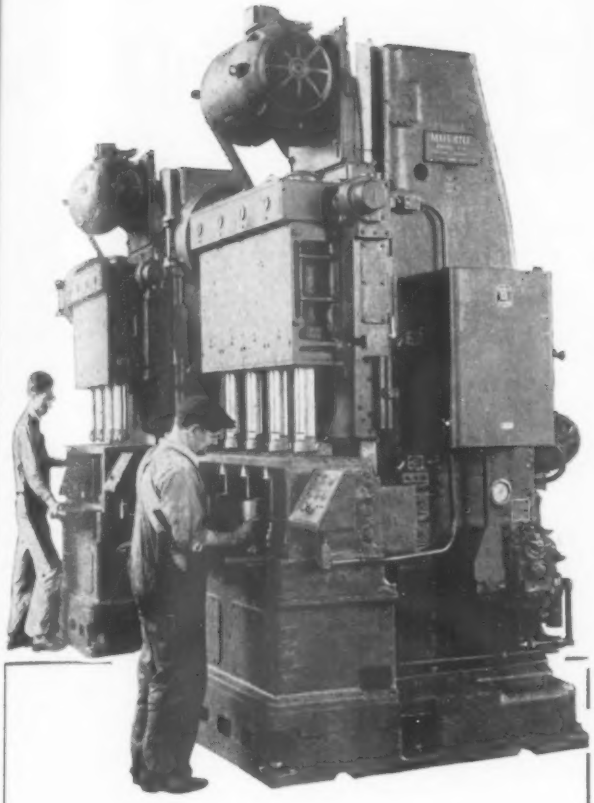

For Straight-line Production Drilling

of medium heavy castings, pipes, channels, angles or plates.

MOLINE HD 13 Drillers are unsurpassed for long-run production work, but can be changed over quickly and easily for new jobs—by simply respacing, removing or adding spindle heads on the rail, by selecting drive gears for correct rate of spindle rotation, and by adjustment of the electric push button controlled automatic feed cycle. The feed of the T-slotted table is actuated hydraulically and is equalized from end to end of the table by rack and pinion mechanism. The table is T-slotted for fixture mounting and positive stops can be provided for drilling or spot-facing to exact depths as well as jump feed feature for drilling tubular shapes.

DESIGNERS AND BUILDERS OF SPECIAL PRODUCTION MACHINERY SINCE 1901

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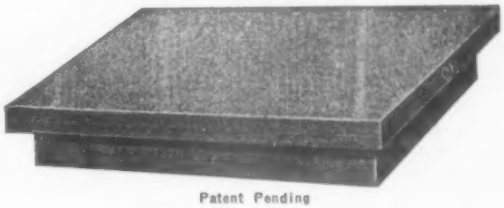
"HOLE HOG" Drilling, Boring, Honing, and Tapping Machines

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

Herman PRECISION GRANITE Surface Plates



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Distinctly New . . . Definitely Superior .

Herman PRECISION GRANITE Surface Plates eliminate once and for all the disadvantages and uncertainties of old-fashioned metal surface plates. Cut from solid granite, they cannot warp and will remain accurate to 1/10,000 inch overall. Practically non-porous, they do not become charged with tool damaging abrasive particles. Corrosion and rust-proof, they are as nearly indestructible as man and nature can make them. Already scores of shops throughout the country have declared them unequaled for precision work. Let Herman PRECISION GRANITE Surface Plates increase production efficiency and economy in your shop. Write today for full information.

Standard Sizes and Weights

12" x 18" — 75 lbs.
18" x 24" — 160 lbs.
20" x 30" — 275 lbs.
24" x 36" — 480 lbs.

CUSTOM SIZES ON REQUEST

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PRICES ARE REASONABLE

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THE PASSING PARADE

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

Daniel C. Green has been elected chairman of the board of The Cleveland Pneumatic Tool Co. and its subsidiary, Cleveland Pneumatic Aerol, Inc. He has been associated with the company since early in 1942, when he was appointed director and chairman of the board. He continued in this capacity until June of 1943 when he was elected president to fill the vacancy created by the resignation of **John DeMooy.**

Also announced by the company is the election of **George P. Torrence** as president. He formerly was vice-president and general manager of Rayon Machinery Corp. Prior to his connection with that company he served the Link Belt Co. in various capacities.

The National Foremen's Institute, Inc., announces that **Bruno R. Neumann,** previously senior economist with the Planning Division of the War Production Board, has joined the organization as labor economist and editorial director.

He will head up the Institute's research and consulting service on labor economics and labor relations. Prior to his association with WPB, Mr. Neumann was a member of the economic research staff of the National Association of Manufacturers.

Lake Shore Tool Works, Inc., announces the election of **David A. Coleman** as vice-president of the company. He has held positions of personnel manager, production manager, and sales manager for the company.

Bert Conway **D. A. Coleman**

The Aviation Corp. announces that **Bert Conway** has been named vice president in charge of manufacturing. He has been manufacturing coordinator for the corporation as production and tooling adviser at all plants since last April.

His previous production experience includes service with General Motors as manager of the Chevrolet-Toledo plant, general master mechanic of the Pontiac plant at Detroit, and manager in charge of manufacturing and production testing at the Allison aircraft engine plant at Indianapolis. He also has served with Ford Motor Co. and the Liberty Starter Co.

Appointment of **Philip H. Clapp** as abrasive division district manager for the Pacific coast is announced by the Norton Co. A Norton employee for 30 years, he has been abrasive division district manager for the Detroit area since 1935.

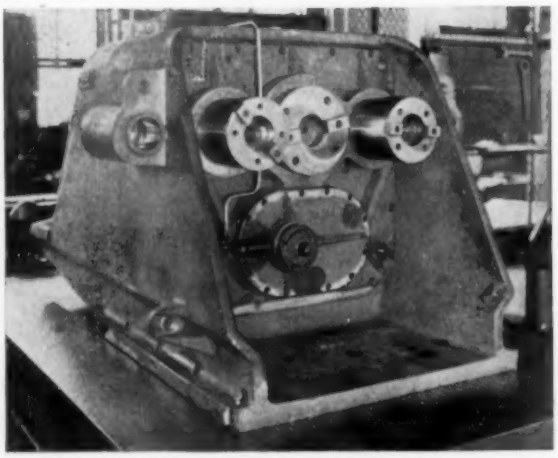
Donald L. Price has been appointed abrasive division district manager to succeed Mr. Clapp in the Detroit district. He has served that area since 1926 as field engineer and abrasive engineer.

Albert W. Lavers, formerly chief engineer for the Minneapolis-Moline Power Implement Co., has joined Harry Ferguson, Inc. as industrial tractor engineer.

Mr. Lavers, who is credited with

(Continued on page 218)

BORE TOWARD QUICKER VICTORY WITH Buhr HEAVY DUTY HEADS



DESIGNED BY BUHR ENGINEERS TO SPEED VICTORY

THE SOLUTION TO AN INDIVIDUAL PRODUCTION PROBLEM

An old vertical 2 column hydraulic machine was retooled with this 3-spindle, Heavy Duty Buhr Boring Head for rough and finish boring 9.218 and 5.751 holes.

Send blueprints for suggestions and recommendations to speed ***YOUR*** production for quicker victory.

BUHR MACHINE TOOL COMPANY

ANN ARBOR MICHIGAN

A Hot Tip!

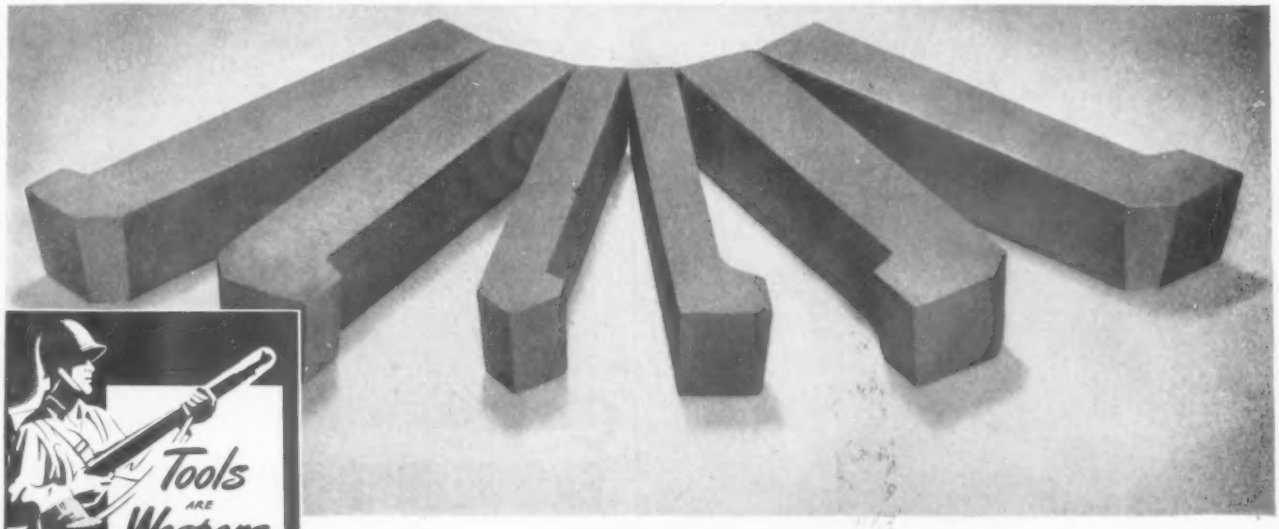
IF YOU TIP YOUR OWN TOOLS

IF you want to get more production out of your present machine tools... Or if you want to lengthen the life of your cutting tools...

Try out Cooper-Bessemer's Victory Tool Shanks. Our own machine shops have used them for years. Hundreds of other war production shops are using them, too. They've stood the test, proved beyond question that they can out-perform and out-last the best, most expensive high-speed steel tools.

Victory Tool Shanks are cast to shape of tough Meehanite. They come to you ready to affix your own cemented carbide tips. They require a minimum of finish machining. They pay for themselves many times over in a short time.

Many standard shapes and prices are shown in our Bulletin 53T-2. We'll send you FREE samples to test in your own shop. . . also quote you on your special shapes. Let us work with you.



THE Cooper-Bessemer CORPORATION

DEPT. E., MOUNT VERNON, OHIO

having designed and built the first internal combustion spark ignition tractor engine to burn 70-octane gasoline. has been consultant to the Farm Machinery Division of WPB and chairman of the Tractor War Emergency Committee of the Society of Automotive Engineers.

Appointment of **John P. Bernard** as vice-president and general manager has been announced by Sheffield Corp.

Before joining the organization in 1942, Mr. Bernard served 17 years with the Dyer Company industrial management and engineering concern, his last position being executive vice-president in charge of operations.

John Bernard **Glenn Bauder**

Glenn E. Bauder, tool superintendent at the Elmira plant of Remington-Rand Inc., has been named assistant plant manager at the company's Syracuse plant. He had previously held positions as development engineer, superintendent of assembly, and tool supervisor.

Died: Niels A. Sorensen, superintendent of the automotive and diesel crankshaft division of the Ohio Crankshaft Co., March 7, of burns suffered when a small gas heater exploded in his home. He was 63 years old.

Mr. Sorensen, who had been connected with Ohio Crankshaft since 1937, is credited with perfecting a method of removing broken drills from crankshafts by the use of a small quantity of dynamite.

Before joining the Ohio Crankshaft organization he had served with the Grant-Lee Gear Co., the Chandler Motor Car Co., and the Hupp Motor Co.

New works manager in charge of all production for the Bear Mfg. Co. is **Henry E. Hermann**, according to a company announcement.

Prior to his appointment, Mr. Hermann served for several years as plant engineer for the John Deere Plow Works. He previously had plant supervision experience in various capacities with the John Deere Spreader Works and the John Deere Tractor Works.

Stanley M. Cooper, vice-president of the Fafnir Bearing Co., has been appointed assistant director of the Tools Division of the War Production Board. He has joined WPB to handle problems relating to anti-friction bearings.

George M. Bowen, president of the Ross Operating Valve Co., died March 8 at Detroit. He was 51 years old.

Mr. Bowen, a member of the American Society of Tool Engineers, had been associated with the Ross Company for 25 years. Prior to that time he had been connected with the Norton Company.

A. Erhardt **Geo. Bowen**

Anton Erhardt has been named plant superintendent of National Tool Co. with full charge of production of precision metal cutting tools. He is credited as being the inventor of an improved herringbone gear-shaper cutter widely used throughout the industry.

Since starting with the predecessor organization of National Tool Co. 36

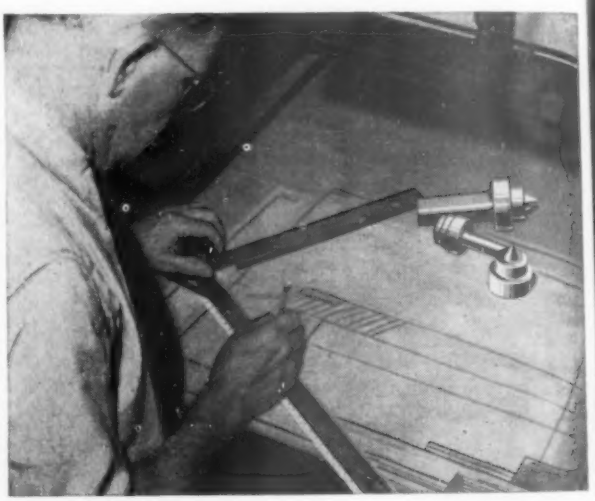
(Continued on page 220)

Simplified Grinding
with **PARKER-MAJESTIC**
Internal and External Grinders

For precision grinding . . . internal or external . . . Majestic simplicity of design and flexibility of changeover guarantee maximum grinding output at low cost.

Send for descriptive circular . . . NOW!
Representatives in all principal cities.

PM **Majestic Tool & Mfg. Co.**
2950 E. WOODBRIDGE • DETROIT 7, MICH.



ENGINEERED LIVE CENTERS

A properly designed Live Center is one of the fundamentals of setting up a job and requires a specialist's experience. Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action that compensates for expansion due to heat shock and excessive thrust loads—reducing wear to a minimum. Send us your blueprints and specifications — we will see that your job gets set up with the right Live Center. ***Standard shanks with Morse taper carried in stock.***

STURDIMATIC **TOOL COMPANY**
5218 Third Avenue
DETROIT, MICHIGAN
LIVE CENTER

Essential War Industries Working for Speedy Victory Endorse Eastern's Service

Since Pearl Harbor, thousands upon thousands of worn, high-speed tools of all descriptions have been reconditioned in our plants.

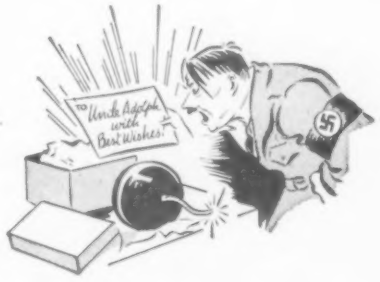
With skill developed through 30 years' experience, our staff has demonstrated repeatedly that scrap tool piles are often much more than mere collections of useless junk.

In fact, we've restored tons of decrepit-looking cutters to active service, and have converted many into special tools. Working in close cooperation with hundreds of factories all over the country, our men at Eastern have solved a bookful of reconditioning problems, while demonstrating that tool costs can often be cut as much as 50%.

Deliveries have been made in days instead of weeks. Clients' tool inventories have been notably reduced, with great savings in critical materials. Many customers have also availed themselves of our quick service on standard tools carried in stock.

In the interest of getting maximum service out of your existing tool equipment, we invite inquiries. We will be glad to consult with you, at no obligation.

• One of the best ways to hasten Hitler's harvest of the seeds of hate he has sown is to avoid waste of time, manpower, and materials.



• Make rigorous tool conservation a law in your plant!

• Investigate the scrap piles at once—there is probably a lot of good service in those tools that have been tossed aside simply because they are worn or damaged.

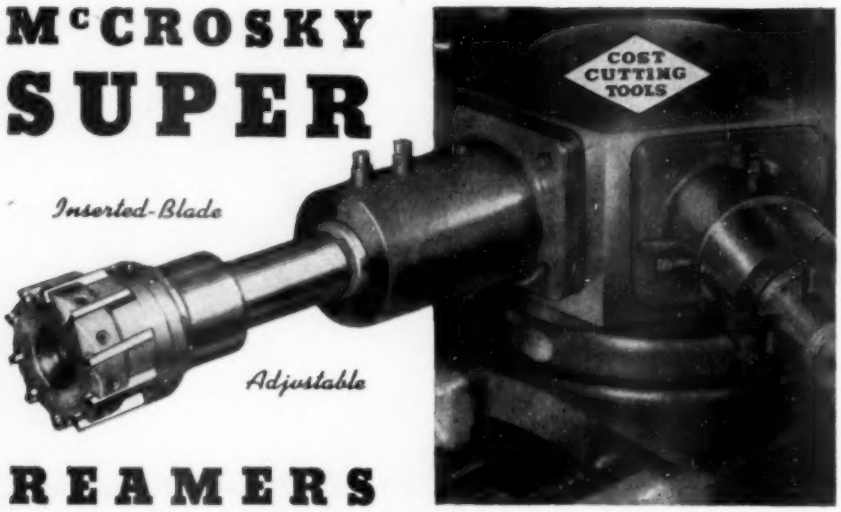
A COMPLETE RECONDITIONING SERVICE FOR TOOLS

NEW MILLING CUTTERS FROM OUR STOCK OR YOUR OWN STANDARD CUTTERS CAN BE QUICKLY CONVERTED TO SPECIAL CUTTERS

EASTERN CUTTER CORPORATION 30-32 Littleton Ave., Newark 7, N. J.

Chrome Plant **MASTER CHROME SERVICE** INC., 5709 Herman Ave., N. W., Cleveland, Ohio

McCROSKY SUPER REAMERS



STANDARD McCrosky Super Adjustable Reamers delivered from stock have started thousands of war production jobs with a minimum of delay. These time-saving applications are possible because Super Reamers are available in many different styles, with a wide range of sizes in each style.

WHICH STYLE FITS YOUR APPLICATION?

• SUPER Chucking Reamer
Straight, or Morse Taper Shank
• SUPER Shell Reamer with Taper Hole for standard arbor
• SUPER Shell Reamer with large Straight Hole for mounting on line-reaming bar

This fundamental advantage is increased by the ease and economy with which Super Reamers can be maintained at top efficiency. The time-tested Super Pin-and-Screw Lock permits quick adjustment and resharpening of reamer blades with a minimum of down-time. When the original set of blades has been worn out, the reamer can be completely renewed by inserting a new set of blades in the original body. Each size of blade services many different sizes of reamers.

You can depend on quick deliveries of Super Reamers and extra blades from adequate stocks protected by continuous production.

To help you select the right Super Reamer for your application, ask for McCrosky Bulletin 16-A. To help your operators get maximum performance on the job, ask for the McCrosky Reamer Manual.

For further information, write to **McCROSKY, Meadville, Pa.**

EST 1904 McCROSKY TOOL CORPORATION MEADVILLE, PA.

Super Adjustable Reamers • Jack-Lock Milling Cutters
Wizard Quick-Change Chucks • Adjustable Block Boring
Bars • Turret Tool Posts • Special-Purpose Tools

PASSING PARADE

years ago, he has served as punch press and lathe hand and has worked on every operation in the shop. Since 1927 he has been concerned principally with production and application of gear-cutting tools.

Independent Pneumatic Tool Co. announces that **Neil C. Hurley** has been elected chairman of the board of directors.

Also announced is the election of **Neil C. Hurley, Jr.**, as president. He has been associated with the company for 12 years serving as manager of the company's electric tool division, secretary, vice-president, and executive vice-president.

Also elected to the board of directors were **Edward G. Gustafson**, treasurer, and **John McGuire.**

N. Hurley, Jr. **D. Kearney**

Daniel F. Kearney has recently been promoted to general sales manager of Crawford Door Co., according to Elmer **Hahn**, vice-president and general manager. Mr. Kearney has been associated with the company as purchasing director for many years.

Climax Molybdenum Co. announces that **John F. Robb** has been appointed manager of the Pittsburgh district.

Prior to joining the Climax technical staff in 1935, he served successively with Carpenter Steel Co., The Birdsboro Foundry and Machine Co., the Pittsburgh Crucible Steel Co., and the Brighton Electric Steel Casting Co.

A. H. Kean has been appointed general manager of the Edward A. Lynch Machinery Co., according to a recent announcement. He previously had served 28 years with the Bridgeport Safety Emery Wheel Co. as treasurer, an officer of the concern, sales manager, and in many other capacities.

Willys-Overland Motors has announced the appointment of **William E. Paris** as operating manager in charge of manufacturing. In his new duties he will direct manufacturing operations in production of "Jeeps", 155 mm. shells, powder and projectile hoists, and other armaments.

Mr. Paris, a Willys-Overland employee for 28 years, began work as a stock chaser and eventually became general production manager. For the past two years he has been assistant operating manager in charge of manufacturing.

A. J. Tigges has been appointed man-

(Continued on page 224)

IMMEDIATE DELIVERY

AUTOMATICS

Acme, 9/16" Model C, 5 spdle, M.D.
Cleveland, [illegible] 2¾ & 3¾" Model A
Cleveland, [illegible] & 2½" Model B
Cleveland, [illegible] & 1½" 4 spdle, Model M
Gridley, 2[illegible] 3¼, 4¼, & 5¼" S.S.M.D.
Gridley, 9/16 & ⅞" Model G, M.D.
Gridley, ¾ & 1¼" Model F, M.D.
Potter & Johnston, No. 5A & 6A M.D.

GEAR MACHINERY

Barber-Colman No. 3 & 12 Hobbers
Lees-Bradner No. 5A Generator
Fellows Shapers, No. 61 & No. 7 H.S.

GRINDERS

Blanchard No. 16A R.S. with 30 x 18" Magnetic Chuck, 30 H.P. A.C. Motor
Landis 6 x 18 & 10 x 36" Landis Plain, M.D.
14 x 36" Norton Plain, M.D. type 881.

LATHES

Putnam, 60" x 17" with 12" Riser Blocks
Steinle 24" Turret, 4½ & 6¼" hole

MILLING MACHINES

Becker Vertical No. 3, 5B & 6—M.D.
Becker Vertical, Model SD, 40" Rotary Table

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MACHINE TOOLS POWER PRESSES

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All Die Makers' Supplies

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Danly Commercial Sets

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DANLY
PRECISION DIE SETS

POSITION WELDING PAYS!

The position in which welding metal is deposited is receiving ever increasing attention. Studies have proved conclusively, that much time is saved, production is increased, work handling reduced, and a better over-all product results.

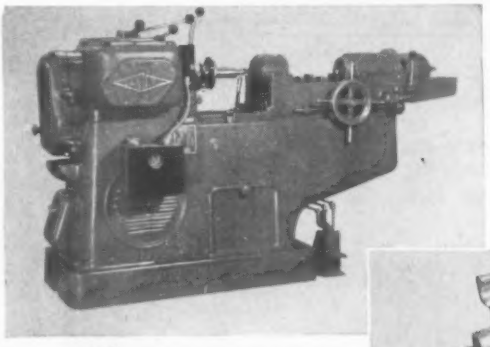
Ransome has just published a new 40 page two color bulletin which tells the story of Position Welding. The complete line of Position Welding Equipment is well illustrated and a good many installation photographs of all types are included.

Write for your copy . . . Ask for Bulletin No. 210B.

WELDING POSITIONERS • TURNING ROLLS • HEADSTOCKS-TAILSTOCKS • SPECIAL POSITIONING EQUIPMENT

Ransome
MACHINERY COMPANY
DUNELLEN, NEW JERSEY

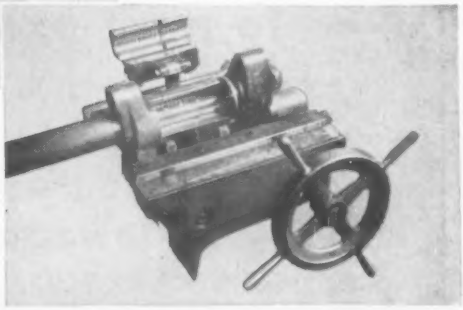
SUBSIDIARY OF WORTHINGTON PUMP AND MACHINERY CORPORATION



The Landmaco Threading Machine (at left), built by the Landis Machine Co., Waynesboro, Pa., is a good example of a leadscrew application of Ampco Metal.

• • •

These leadscrews (see below) are split, and the upper half is in two sections.



Where wear would mean play
. . . and costly loss of smoothness

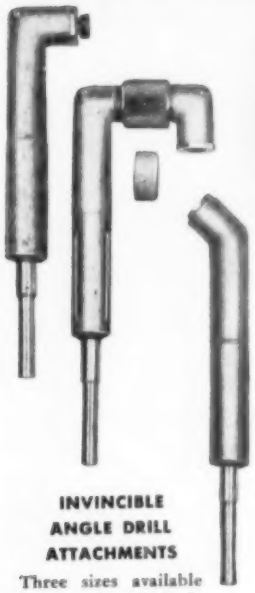
. . . Landmaco Threading Machine is protected with leadscrew nuts of Ampco Metal

AMPCO Metal
The Metal without an Equal

Reg U.S. Pat. Off.

Leading machine-tool builders (almost 100 of them!) protect you against costly failures and breakdowns by using Ampco Metal parts at critical points—to resist wear, impact, fatigue, etc. This superior alloy of the aluminum bronze class lasts several times as long as ordinary bronzes — enabling you to avoid delays due to metal failure. Ask about Ampco Metal parts when you buy machinery. Also use Ampco to replace parts that fail. Write for bulletins. M-4

Ampco Metal, Inc., Dept. TE-4, Milwaukee, Wis.



INVINCIBLE ANGLE DRILL ATTACHMENTS

Three sizes available from stock: 90° single angle, 90° double angle, 45° single angle.

THE BALL WEARS— NOT THE GEARS!

A special thrust ball in Invincible Angle Tool Attachments takes the wear instead of the gears, giving long service life . . . Invincible tools get into close corners, tight spots . . . save time and expense. Check Invincible today on these versatile, high-speed, long-lasting Angle Drill Attachments.

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from simplest

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to most exacting

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GAUGES — TOOLS — FIXTURES
JIGS — SPECIAL MACHINES
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BARTH STAMPING & MACHINE WORKS

Die & Tool Makers

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From an economical standpoint and proven performance, Columbia's MOLITE merits serious consideration for your high speed steel needs.

MOLITE does not require special heat treating equipment.

It pays to use Good Tool Steel.

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Hammond ANNOUNCES A

NEW

CHIP BREAKER AND FINISHING GRINDER FOR CARBIDE TOOLS

Hammond engineers now present to you this new Heavy Duty Chipbreaker and Tool Grinder with all the latest, practical operational features for fast, accurate chipbreaker groove grinding and diamond wheel finishing. It features the new Any Angle Vise (standard equipment) that gives you an easy, simple method of obtaining correct grinding angles. 1/2 HP motor—V-belt drive permits the use of any electrical specifications.

Write for complete data, prices and delivery.

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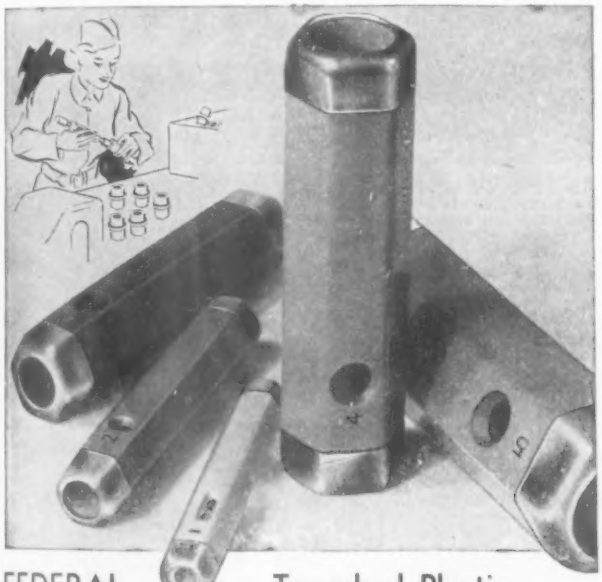
1636 Douglas Ave.. *Eastern Branch* 71 W. 23rd St., New York 10, N. Y.



FEDERAL Taperlock Plastic

GAGE HANDLES

Federal Plastic Gage Handles give gages a more sensitive touch because they are lighter than any metal. They reduce fatigue and insulate from body heat, safe-guarding accuracy. ¶ Marked for identification with the same stamps used for marking metal handles. ¶ Ideal for Glass Gages which require Handles of light weight for best results, reducing danger of breakage as well as adding to sensitivity. ¶ Available in seven standard sizes and in ***colors***—Red, Yellow, Green and Black for easy identification. ¶ New low prices represent a real saving. ¶ **Now available for smaller gages—size 00 in same colors.**

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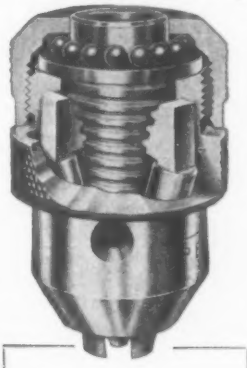
Cut out waste motions and speed up your drilling

with these

5 SIZES for No. 0 to 5/8" drills

Ettco-Emrick KEYLESS DRILL CHUCKS

FOR OVER 20 YEARS Ettco-Emrick Keyless Drill Chucks have been favorites with shopmen—first, because they eliminate the key—and secondly, because, even without this big advantage, there are no better drill chucks made.



Ettco-Emrick Keyless Drill Chucks are ideal for screw machines and can be furnished with straight shanks for turrets. They are also available to fit all makes of portable drills.

TODAY—when every minute counts and women operators are many, these chucks are in greater demand than ever because — that keyless feature saves plenty of time and energy and makes it as easy for women to set up drills as for men. No strength is needed—drilling action does the tightening.

TOMORROW—and as long as drill chucks are used, Ettco-Emrick Keyless Chucks will continue to be favorites because they cut out waste motions and boost production. Once you use them and see for yourself how they speed up drilling, you too, will prefer them.

GET FULL DETAILS IN BULLETIN No. 6

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The Famous Ettco-Emrick DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

TO HELP YOU TEACH THE NEW GRINDER HAND

how to get maximum service from your Diamond Tools—we have some effective training material. Send for it. No obligation.

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Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for All Industrial Purposes.

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Detroit 10, Mich.

PASSING PARADE

ager of consulting engineering for all divisions and subsidiaries of the Baldwin Locomotive Works, according to **Ralph Kelly,** Baldwin president. He will have charge of engineering of new products and new applications with reference to postwar plans.

Since graduating from the Massachusetts Institute of Technology in 1923, he has been associated with the engineering firm of Jackson and Moreland, Boston, doing general engineering research and development work and serving as managing engineer for a number of large power plants.

Also announced by the company is the appointment of **D. I. Packard** as Chicago district manager. He succeeds **Charles Riddell,** who has been district manager since 1905 and who will continue his association with the Chicago office as special representative.

Soren H. Mortensen, chief electrical engineer for Allis-Chalmers Mfg. Co., has been awarded an honorary Doctor of Engineering degree by Illinois Institute of Technology for "distinguished leadership in the development of alternating current machinery."

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Wanted: Middle western firm of 26 years standing offers permanent position to engineer capable of cam layout work for Brown & Sharpe Automatics. State age, draft status, experience, availability and salary expected. Box 809, THE TOOL ENGINEER.

Top-Ability Men will be interested

Executives interested in genuine opportunity in manufacturing concern that has had spectacular growth and has terrific potentialities should communicate with this advertiser who needs:

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- ★ **Tool Engineer**
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Mechanical and electrical education and manufacturing experience valuable. Michigan firm with diversified products in metal working and electrical trades, sold nationally. Employment steady, not seasonal.
Will welcome men who think boldly, impatient to get results. Your own ability your only limit on salary. Write in confidence, giving experience, draft and availability status, and personal data. Box 810, THE TOOL ENGINEER.

NEW LINES WANTED

Established manufacturers' representative in Chicago travelling five men in Indiana, Illinois, and Southern Wisconsin desires a line of special high speed cutting tools and a complete line of carbide cutting tools. Box 808, THE TOOL ENGINEER.

It's the Biggest Little Tool in the Crib

WALTONS cut costly delays and production slowups caused by broken taps. Your tool makers and machinists should have them available in necessary sizes. Many shops say they wouldn't be without them.

Walton TAP EXTRACTORS Back Out Broken Taps

Immediate Shipment of all sizes against rated orders. 48 hour Reconditioning Service for broken and damaged extractors.

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The WALTON Company
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Speeds layout time on brass, aluminum, copper, tin, stainless steel. Oil Resistant. Won't chip, crack or flake off. Also ideal as a marking dye for easy identification of metals. Comes in handy 8 oz. bench type brush-in cans. Also pts., qts., gals.

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DIAMONDS for Victory

Cooler dressing
Closer tolerances
Micrometer Accuracy

Because: Wing key heat dissipation and absolute diamond lock nib.

• Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.)

JOBBERS AND DISTRIBUTORS EVERYWHERE
The Most Complete and Up-to-the-Minute line of Diamond Tools for War Production. Send for free Catalog and Grinders Instruction card.

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LESS OPERATIONS
AND FAR
BETTER WORK
WITH A
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ROTARY PILOT BUSHING

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DUST-PROOF

AS A WATCH

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BALL BEARING GRINDERS

BUILT FOR HEAVY PRODUCTION SERVICE

Baldor Grinder No. 612 has Capacitor Type 1/3 HP Motor guaranteed 2 yrs. against burnout. 3440 r.p.m. 110 volt, 60 cy., single phase. 6" x ¾" wheels; enclosed guards; adjustable eye shields and tool rests. Net weight, 61 lbs. **$33.50**

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Desmond Hex Dresser

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We manufacture the only complete line of Dressers and Cutters and will be glad to advise the proper type and size for your grinding wheels. Write for copy of our catalog "T" and name of your nearest dealer.

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Also manufacturers of Simplex Steel Slide Vises.

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GEAR CHUCKS

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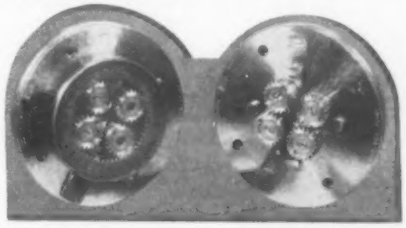

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Grinding, Machining, Precision Boring and other operations on Spur, Internal, Bevel, Cluster, Helical and Herringbone Gears.

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DAYTON 7, OHIO

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Permanently Accurate Torque Wrenches

You can accurately measure applied torque in *inch ounces, inch pounds* or foot pounds, with STURTEVANT Torque Wrenches as they are built in all capacities from 0-40 inch ounces up to 600 foot pounds or 7200 inch pounds. Over 100 models and types. Each is a permanently accurate tool.

Write for Bulletin TW-28

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ADDISON QUALITY ILLINOIS

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There are many features that make the Lufkin Universal Indicator the best tool of its kind.

Built in one unit, it makes a complete revolution on its own center. Readings can be taken from either the flat or top side of the face and in any position. Especially suited for jig boring, milling machine and drill press work. The attachments are furnished for use in drill chucks, surface gages or with a Vermier Height Gage. With this indicator there's no need to use a mirror, or to get in an awkward position for use. For complete information on Lufkin tools write for free catalog.

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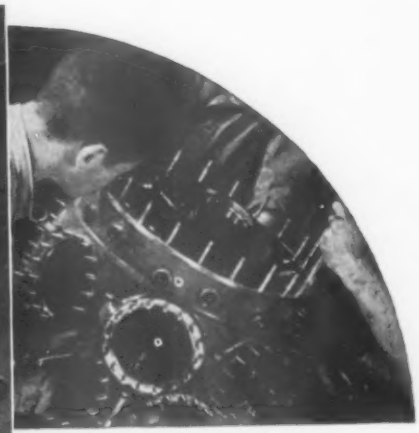

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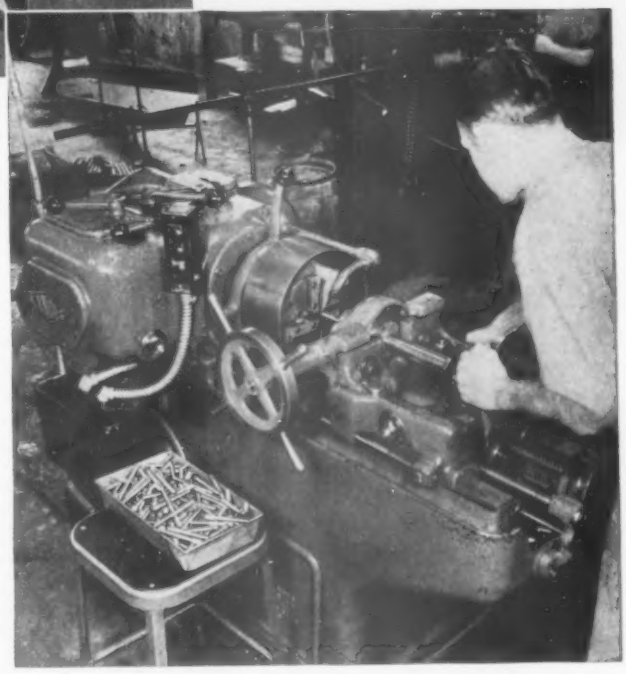

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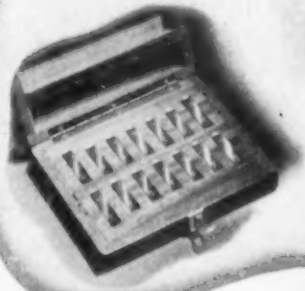

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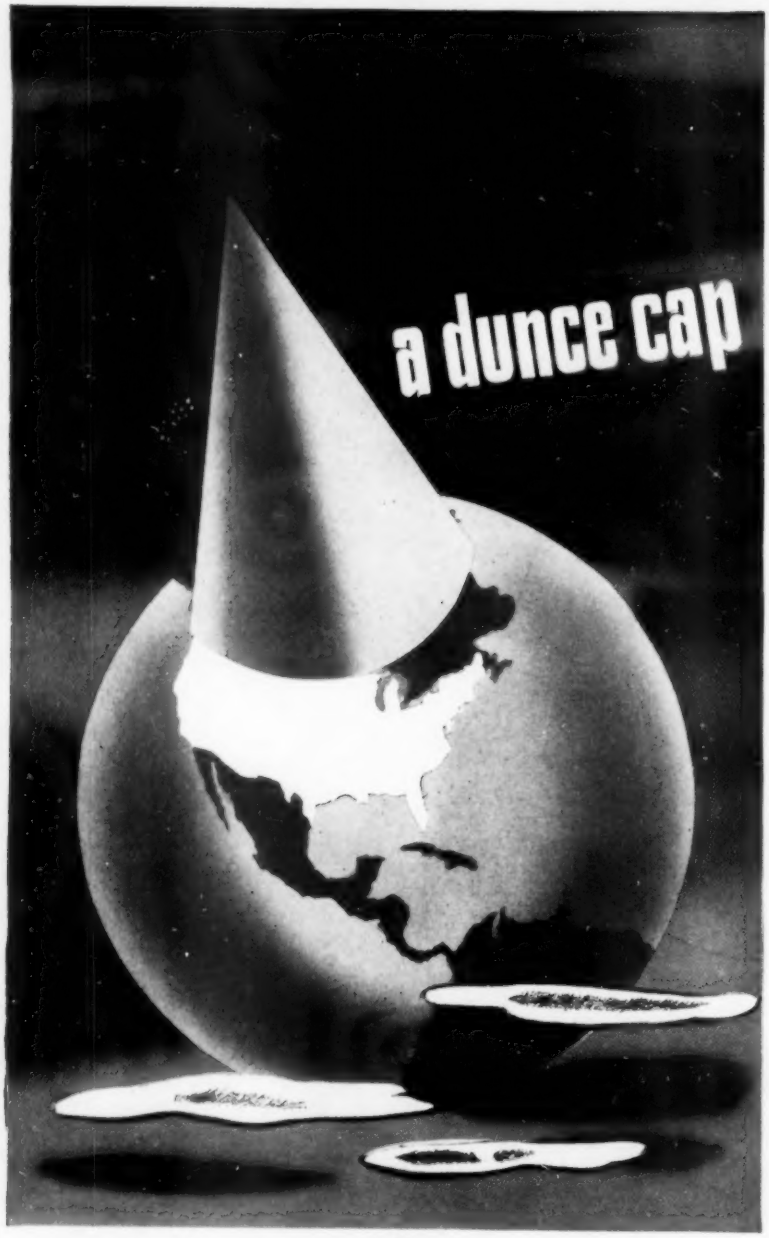

for America!

In the corner of the little one room, red sc
house there stood a high stool. On it was a c
shaped head piece. This wasn't often used,
when it was, the class goon wasn't the only
who wore it. Even the smart one, at some tim
other, had to wear it for *"not paying attenti*

"Not paying attention" claimed more dunce
victims than any other cause.

Today, America suffers the tortures of war
"not having paid attention" to what
going on in the so-called "peaceful interi
While we leaf-raked and loafed, others plan
and plotted. This war caught us off i
corner with the dunce cap on. Will the pea

When present war production at any cost gives
to future product production at lowest cost, it's ei
"pay attention" to world markets, mass sales
low-cost production or again put on the dunce

Returning service men and women will deserv
good turn. So will reconverting American ind
try. LeBlond will supply the good turn in lat
They turn a profit as they produce your prod
It isn't too soon to plan to retool for "peacewo

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